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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1514
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 1515

89 ASTRONOMY 1515
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1516
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1517
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1517
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1518
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1518

Note: N.A. means that no abstracts were assigned to this category for this issue.

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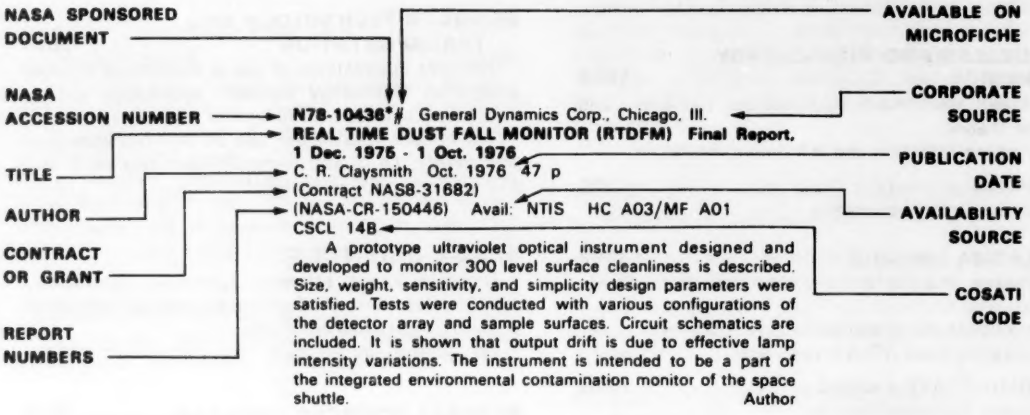
TYPICAL CITATION AND ABSTRACT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N78-10436*# General Dynamics Corp., Chicago, Ill.
REAL TIME DUST FALL MONITOR (RTDFM) Final Report, 1 Dec. 1975 - 1 Oct. 1976
C. R. Claysmith Oct. 1976 47 p
(Contract NAS8-31682)
(NASA-CR-150446) Avail: NTIS HC A03/MF A01
CSCL 14B
A prototype ultraviolet optical instrument designed and developed to monitor 300 level surface cleanliness is described. Size, weight, sensitivity, and simplicity design parameters were satisfied. Tests were conducted with various configurations of the detector array and sample surfaces. Circuit schematics are included. It is shown that output drift is due to effective lamp intensity variations. The instrument is intended to be a part of the integrated environmental contamination monitor of the space shuttle.
Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects— not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, REVISION OF USAF GUIDE FOR AERODYNAMIC DECELERATOR DESIGN AND PERFORMANCE
H.W. BIXBY, Irvin Industries Incorporated, *Gardena, California* (DF133950; F33615-75-C-3081)

The USAF Parachute Handbook has been the single most important document utilized by personnel associated with the development and application of parachute subsystems. The most recent publication is eleven years old and its content is largely obsolete due to state-of-the-art advances and completely void steerable parachute technology information. Revision of this document to reflect the latest state-of-the-art of parachute design and performance prediction and wide dissemination to government agencies and industry will aid significantly in the expeditious development of effective and reliable parachute subsystems for military applications.

Individual chapters of the current document will be revised in sequence with initial documentation efforts in those areas where technology advances are not currently in progress. A new chapter reflecting steerable parachute technology will be generated. Data sources will include reference documents and personal contacts with knowledgeable personnel in the areas under consideration. Cooperation from DoD and NASA agencies as well as industry is anticipated. Compilation of all data and information in a single document is envisioned.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0002, PRELIMINARY DESIGN OF LOW-COST ADVANCED TITANIUM STRUCTURE
J.K. PULLEY, Rockwell International Corp., *Los Angeles, California* 90009 (DF136840; F33615-76-C-3066)

Performance requirements of advanced military aircraft indicate the desirability of using titanium as a major structural material in order to achieve the necessary strength/weight fraction and/or thermal capability. The high cost of material, conventional primary production processes such as forging, and machining make acquisition costs for titanium airframe structural hardware non-competitive with more conventional materials. The objective of this effort is to define design/production options which allow more efficient use of material and production innovations with a goal of 25-30 percent acquisition cost reduction over current titanium hardware without sacrifice of structural fraction, integrity or life.

A number of titanium components or assemblies of existing prototype, development and/or early production status AF aircraft shall be selected for investigation of potential cost reduction innovations in design and manufacturing methods to achieve acquisition cost reduction goals for limited and production quantity procurements without significant sacrifice of structural integrity or vehicle performance. New designs incorporating advanced manufacturing methods and innovative configurations shall be generated and analyzed in terms of systems performance, acquisition cost and life-cycle cost to illustrate the potential systems advantages of lower cost titanium structures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, HEAD-UP DISPLAY EVALUATION
UNKNOWN, U.S. Natl. Aero. & Space Adm., Ames Research Center, *Moffett Field, California* 94035 (FA77WAI-725; FA160245 (TRAIS NO.))

The purpose is to determine, by cooperative NASA/FAA effort using simulation and laboratory studies, what contribution, if any, a head-up display (HUD) can add to aviation safety in the operations of large turbojet aircraft. Within the scope of this evaluation, a comprehensive Program Plan should be developed to meet the overall objectives of this effort and to establish valid methods of determining the interrelationship between the crew, the aircraft and the cockpit displays through simulation and laboratory experiments.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0004, NAVY VEHICLE DESIGN AND CONSTRUCTION - PREDICTION OF HOT GAS REINGESTION EFFECTS ON VTOL AIRCRAFT
A. KAREMAA, General Dynamics Corporation, *San Diego, California* 92138 (DN675408; N00014-76-C-0698)

The objective is to formulate an improved methodology for predicting lift loss effects in VTOL aircraft during hovering flight modes. These lift losses result in large decreases in mission capabilities due to excessive fuel consumption. Improved predictive capabilities are needed to more accurately define the propulsive requirements for future VTOL aircraft designs.

Lift losses are due to both near-field and far-field recirculation of the hot jet exhaust gases. Both flow regimes are being investigated in a multi-phase research effort. In the first phase emphasis has been placed upon developing an improved understanding of the aerodynamic and thermodynamic characteristics of the near-field fountain flow regime. A combined theoretical and experimental approach has been taken. Aerodynamic and thermodynamic models are being developed from theoretical considerations. Tests will be performed to measure needed aero and thermal characteristics and their sensitivities to various geometrical parameters. The theoretical models will be refined and improved based on the experimental results. Essentially the same approach is being taken to investigate the far-field hot gas recirculation flow field including the effects of ambient winds.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0005, EVALUATE SF6 TAGGED BLASTING CAPS
UNKNOWN, U.S. Energy Res. & Dev. Admin., *Washington, District of Columbia* 20545 (FA77WAI-712; FA59838 (TRAIS NO.))

This agreement is to provide for a study of the feasibility of tagging explosives or blasting caps with sulfur hexafluoride(SF6) for the detection of such explosives or blasting caps.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0006, VHF AVIONICS MODIFICATIONS/AIR TRAFFIC CONTROL

UNKNOWN, Bendix Corporation, *Fort Lauderdale, Florida* 33310 (FA59121; FA75WA-3705)

(1) Demonstrate that it will be possible to attain the quality of service expected in an operational phase for air traffic control (ATC) and air carrier purposes; (2) Evaluate the technical and operational performance of voice and data communication between ground and aircraft over various areas; (3) Permit experimental evaluation of dependent and independent surveillance capabilities, and of navigational data derived by an aircraft utilizing ground and satellite transmissions; (4) Directly compare the performance of VHF and L-band aeronautical satellite systems for voice and data communications and surveillance.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0007, FLAMEHOLDER COMBUSTION INSTABILITY STUDY

J.P. RUSNAK, United Technologies Corp., *West Palm Beach, Florida* 33402 (DF459250; F33615-76-C-2023)

To conduct a combined analytical and experimental research effort to determine or recommend improved flameholder designs to control or eliminate conditions which lead to low-frequency augmentor instability.

This is the second of a series of two procurement actions that result from this program. Part II is an in-depth investigation of the heat release at the flameholder subject to longitudinal pressure disturbances. Part I investigates the analytical and experimental development of a mathematical model to predict low-frequency instability in reacting flow. This Part II is a dual award with Northern Research and Engineering Corporation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0008, COMBUSTION NOISE PREDICTION MODEL, ENTROPY/VORTICITY CORRECTIONS

UNKNOWN, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (FA77WA-4077; FA160432 (TRAIS NO.))

The Theory shall be extended to include vorticity-generated noise at the nozzle entrance plane. Theoretically based calculations, which include the effects of vorticity, entropy and direct combustion noise, will be made, using the results of 1.3 Entropy Tube Studies, in order to explain the results of 1.2 Combustor Experimental Studies.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0009, DEVIATION ANGLE PREDICTION

G.K. SEROVY, Iowa State Univ. of Sc. & Tech, School of Engineering, *Ames, Iowa* 50011 (DF459720; F33615-76-C-2090)

The objective of this effort is to devise improved means of predicting the deviation angle associated with modern, high-performance, axial-flow-compressor blade sections. Compressor performance is acutely sensitive to these angles, this sensitivity increasing with increasing rotor speed. Present design systems rely on empirical prediction methods dating from 1940 with 'experience factors' added to account for the differences related to higher Mach numbers and modern airfoil geometry. The intent of this effort is to derive improved formulations which take into account more details of the blade geometry and other parameters having an influence on the result.

The contractor will acquire and evaluate a body of compressor blade section performance data which may be of sufficient quality to support an improved deviation angle correlation. Variables related to the detailed blade geometry and fluid dynamic environment will be incorporated into correlation parameters and matched with the collected data in an effort to find and evaluate improved deviation angle prediction techniques. Particular attention will be paid to approaches allowing a smooth transition from conventional blade sections to 'S' shaped sections often found near the tip or transonic and supersonic blade rows. The present status of blade row exit flow angle prediction will be quantitatively defined. Recommendations will be made for the form of more effective new or improved correlation equations and systems for both design and analysis problems in compressors. The limits of applicability of the proposed correlation formats will be specified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0010, FLIGHT DIRECTOR SYSTEM FOR A GRUMMAN GULFSTREAM I (G-159) AIRCRAFT

UNKNOWN, Rockwell International Corp., *Cedar Rapids, Iowa* 52406 (FA77NA-4041; FA160464 (TRAIS NO.))

The contractor will furnish a complete Flight Director System for a Grumman Gulfstream I (G-159) aircraft. The Flight Director System will be an FGS-80 system. Two flight guidance computers will be furnished as part of the system. One flight guidance computer will be a standard FGC-80 flight guidance computer. The second flight guidance computer will be an experimental unit in which quickened flight director control laws have been implemented. The second unit will be a direct plug-in replacement for the standard flight guidance computer.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0011, AVIATION AUTOMATIC WEATHER OBSERVING SYSTEMS (AV-AWOS)

J.A. CUNNINGHAM, U.S. Dept. of Commerce, Equipment Development Lab., *Silver Spring, Maryland* 20910 (RD5907)

TECHNICAL OBJECTIVE: To design, develop and evaluate an automatic weather station capable of providing aviation weather observation of the same quality as now provided by human observers. Development of procurement specifications.

APPROACH: 1. Execution of the AV-AWOS system upgrade procurement; 2. Execution of the AV-AWOS field evaluation at Patrick Henry Field; 3. Completion of the AV-AWOS procurement specification for the FAA.

PROGRESS: A contract was awarded in April 1977 to Ford Aerospace & Communications Corporation, Western Development Laboratories, Palo Alto, California, to upgrade the developmental model AV-AWOS. The ultimate goal of Ford's effort is to test AV-AWOS in an operational environment. Ford has modified the existing AV-AWOS software. Additional software was added to support a hail and a thunderstorm sensor. Ford added the capability of producing a computer generated voice of the AV-AWOS observation by adding a Speech Technology Corporation voice generator. Five CRT displays were also added for displaying the AV-AWOS observation at remote locations. Ford completed upgrading the developmental model AV-AWOS in late FY1977, and began installing the system at Patrick Henry Airport, Newport News, Virginia. The National Weather Service and the FAA will conduct a user test there beginning in early FY1978.

EDL will prepare specifications for use by the FAA for procurement of operational AV-AWOS systems.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin., Systems Research & Development Service

1.0012, VIBRATION OF COMPOSITE SHELLS WITH TRANSVERSE SHEAR

T.H. PIAN, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DF140450; AF-AFOSR-3335-77)

This effort will support the design of military aircraft structures. It will improve the performance of the aircrafts and reduce the cost of the aerospace vehicles. Structural dynamics is an important facet in the design of flight vehicles. There is a need to correctly predict the vibration characteristics of advanced composite shells. This effort will develop a computer program to investigate the vibration characteristics of composite shells taking into consideration the transverse shear. The analytical results will be compared with experimental results. This will provide an improved reliable analytical tool for the design of structures leading to reliable military aircrafts.

The method of finite-element analysis will be used to predict the vibration and mode shape analysis of composite shells and compare the results with the experiments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0013, NAVY VEHICLE DESIGN AND CONSTRUCTION - DEVELOPMENT OF A UNIFIED THEORY FOR VORTEX-WING INTERACTIONS

S.E. WIDNALL, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DN475136; N00014-75-C-0257)

Wing-vortex interactions play a fundamental role in determining the flight characteristics of high-performance aircraft. The objective of this research is to develop a unified theory of vortex-wing interactions for improved understanding and reliable prediction of complex flows over wing surfaces, and for optimizing the application of vortex-wing interactions in the design of high-performance aircraft as well as effecting solutions to their problems.

A more economical version of the Nangia and Hancock three-dimensional wing-vortex interaction model will be developed by the use of continuous loading functions. The primary goal is to develop the capability to predict wing loading or arbitrary planform wings with free vortices. The analysis will include the effects of near field wing-vortex interactions such as vortex breakdown, section peaks, and the rolling up of the leading-edge sheet.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0014, NAVY VEHICLE DESIGN AND CONSTRUCTION - HIGH-ANGLE-OF-ATTACK STABILITY AND CONTROL

R. STENGEL, Analytic Sciences Corporation, *Reading, Massachusetts* 01867 (DN575168; N00014-75-C-0432)

At high angles of attack the flying qualities of most high-performance aircraft deteriorate due to undesirable characteristics such as wing rock or departure from controlled flight. These characteristics significantly reduce tracking capability and maneuverability, and can lead to loss of control and difficult or impossible recovery problems. The objective of this program is to develop an analytical framework of study for the high-angle-of-attack stability and control problem, and to identify designs of departure preventing control systems.

This third year's work will validate the analytical techniques developed during the first two years. The validation will be based upon extensive nonlinear simulation of the aircraft motions utilizing the previously defined departure prevention command augmentation system (DPCAS) as well as processing of actual flight test telemetry data from the F-14 aircraft. Piloting techniques and response patterns from the same series of F-14 flight tests will be used to validate the previously defined pilot model.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0015, REREPS VALIDATION TESTS

G.C. HOFF, U.S. Army, Waterways Experiment Station, *Vicksburg, Mississippi* 39180 (DA0U8015)

To validate the ability of a regulated-set cement runway crater repair to withstand the necessary aircraft loads within a period of 4 hr after completion of the repair. Included in this validation is the requirement for load transfer between the old and new pavement around the edge of the repair and a quick method for providing for the transfer. Through these tests the requirement for subgrade strength will be determined. The method of screeding a large crater will be examined.

The approach to the validation involves the construction of a 12 in. thick concrete pad 50 x 200 ft with four 30 ft diameter holes in the center. The holes will be excavated and filled using the technique developed in Germany for repairing a crater. The craters will be capped with regulated-set cement. The repairs will be load tested starting immediately after completion of the repair with a F4C aircraft wheel. After a period of time, the aircraft type will be changed to a C-141. Results of the load test will validate the method presently used for repair in Germany.

SUPPORTED BY U.S. Dept. of Defense, Office Chief of Engineers, Corps of Engineers

1.0016, SUPERPLASTIC FORMING/DIFFUSION BONDED AIRCRAFT STRUCTURE

D.J. DORR, McDonnell Douglas Astro. Co., *St. Louis, Missouri* 63166 (DF138430; F33615-76-C-3139)

This effort supports development of lower cost metallic structures for advanced systems applications. Excessive cost of Ti built-up aircraft structure prohibits wide use of this material to achieve increased performance of AF systems. Recent development in Ti fabrication techniques shows significant potential for producing affordable Ti airframe structures. The objective of this effort is to validate a 40 percent cost reduction potential in large compound curved aircraft panels utilizing the superplastic formed/diffusion bonding process in conjunction with advanced technology designs not feasible with conventional fabrication techniques. The validation provided by this effort will provide the basis for subsequent advanced development programs (6.3) to extend the application of this technology to primary structure for future AF systems.

The validation program will consist of redesigning the F-15's lower left engine nozzle fairing, part no. 68A334004, fabricating it by superplastic forming and diffusion bonding, developing cost comparisons to the product part, and experimentally verifying its structural adequacy. Additional panels will be delivered to the Air Force Flight Dynamics Laboratory for further evaluation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0017, PREDICTION OF AERODYNAMIC HEATING TO GENERALIZED THREE-DIMENSIONAL SHAPES

H.J. BRANDON, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (DF139390; F33615-77-C-3003)

At high speeds, above Mach 3.5, aerodynamic heating becomes a design constraint for missiles and aircraft. Therefore, definition of the heating to the flight vehicle is required to adequately design the structure and define the operating limits. Poor definition of the heating can result in weight increases, degraded performance and increased cost. The objective of this effort is the development of an analysis tool for the prediction of heating to flight vehicles. This will improve the ability to determine heating levels thereby decreasing uncertainties in design.

Several programs have been developed for the prediction of heat transfer rates to flight vehicles; all of these programs have limitations which significantly restrict their use. These programs will all be reviewed and the most promising one will be selected for modification. After existing limitations have been removed, the program will be extended to more general flows such as the complex flow in the fin region.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, DEVELOPMENT OF A COMPREHENSIVE RDT/E PROGRAM FOR GROUND SUPPORT EQUIPMENT

M. PALAMAR, U.S. Navy, Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN133406)

To develop a systematized RDT/E program which will define and integrate future ground support requirements with a comprehensive RDT/E effort insuring an optimal operational support capability for future generation aircraft and weapons systems.

Develop a detailed identification of the testing, servicing, maintenance, and handling functions necessary to support aircraft and associated directives, along with organizational structure for the planning and managing of GSE RDT/E. Develop and implement systematic measures to insure prompt consideration of ground support equipment requirements which may be introduced by advancements in airborne systems, changes in support technology, or changes in the operational environment. Develop a long-range plan for GSE RDT/E to parallel aircraft systems and technology forecasts.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0019, PAPERED ROLLER BEARING DEVELOPMENT FOR AIRCRAFT

D. OTTO, Timken Roller Bearing Company, *Canton, Ohio* 44706 (DF458670; F33615-76-C-2019)

Develop a higher strength cage and further define the performance capabilities, including endurance, of tapered roller bearings within the framework of current turbine engine mainshaft bearing technology.

Utilize finite-element techniques to better define cage requirements. Conduct tests to evaluate new cage designs. Conduct tests to determine effects of start/stops, lube starvation, etc. Conduct endurance tests on full-scale bearings.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0020, ACTUATION SUBSYSTEM EFFECTIVENESS ENHANCEMENT

G.D. JENNEY, Dynamic Controls Incorporated, *Dayton, Ohio* (DF139940; F33615-77-C-3077)

Actuation subsystems now contribute over 50 percent of the total cost of the flight control system and account for a large share of the logistics support requirements. A need exists to reduce the flight control initial and life-cycle costs by developing less complex systems more suitable for universal applications, developing lower cost component parts and developing criteria for increased commonality. Simpler componentry and modularization will reduce acquisition and life-cycle costs. Particular emphasis shall be applied to the development of a basic 'fly-by-wire' redundancy scheme of superior performance for general application. The resulting 'pre-designed' systems shall be optimized to exhibit improved reliability and maintainability. Matching the performance requirements of the aircraft with the control surface actuators will eliminate oversizing of actuators or sacrificing of performance at key portions of the flight envelope.

Investigate and develop techniques to simplify or eliminate major subassemblies, to promote modularization of actuators, to reduce component complexity and cost and to perform required functions (e.g., position and rate sensing) via alternate methods. Demonstrate the application of higher bandwidth actuators, investigate improved interfacing techniques, alternate redundancy schemes and methods for reducing life-cycle costs for flight control systems. Set up and conduct evaluation tests, in the flight control actuation and hydraulic facility located in building 145, Wright-Patterson AFB, on equipment such as integrated actuator package and integrated valve-actuator assemblies. In addition, wind-tunnel test a flutter suppression actuator to evaluate advanced actuation equipment developed during a prior program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, RAMJET FLUID DYNAMICS

J.E. DREWRY, U.S. Air Force, Aeropropulsion Laboratory, *Dayton, Ohio* 45433 (DF458790)

The objective of this effort is to conduct experimental and analytical studies of fluid dynamic and chemical kinetic phenomena related to advanced ramjet propulsion systems, with particular emphasis on the sudden-expansion dump combustor.

Experimental studies of non-reacting and reacting combustor flowfields will be performed using an axisymmetric sudden-expansion dump combustor test configuration. Detailed measurements of total pressure, static pressure and gas species concentrations will be made within the combustion chamber for various combustor geometries and inlet conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0022, DIGITAL DATCOM COMPUTER PROGRAM FOR AIRCRAFT STABILITY AND CONTROL

J.E. JENKINS, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF132910)

Rapid and inexpensive methods for predicting the aerodynamic stability and control characteristics of Air Force weapon systems are needed. The availability of these methods will lead to better aircraft designs by permitting rational trade-offs to be considered early in the design. The objective of this work unit is to provide improvements in the digital DATCOM computer program, which is an automated stability and control prediction tool. At its current stage of development, it is an efficient computer tool; however, improvements are needed to reduce the engineering time required to prepare input and to interpret output.

Digital DATCOM will be applied to various types of problems, e.g., preliminary design, correcting wind-tunnel data to obtain the effects of configuration changes, etc. The experience gained will help identify weaknesses in the digital DATCOM program. Particular emphasis will be placed on the evaluation of the input requirements and output suited to specialized tasks, as well as method accuracy and range of applicability.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0023, EMERGENCY CREW ESCAPE SYSTEM DESIGN AND PERFORMANCE ASSESSMENT

L.A. JINES, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF136580)

The fatality rate among USAF ejectees from military aircraft is increasing. This is true in spite of many apparent improvements to operational ejection seats. Because of cost and other practical physical limits an ejection seat system is never fully tested. Modifications are then incorporated with similar lack of demonstration of capability. Comprehensive technical evaluation capability needs to be developed to insure that the limited testing is most effective. The objective of this effort is to develop a reliable and valid analytical capability for military crew escape systems to use in design of escape systems, accident investigations, performance evaluations, etc. Extensive effort will also be expended toward the development of a crew escape concept for safe escape while under high acceleration loads.

Emergency crew escape statistics will be analyzed to determine conditions at ejection for possibly indicating a pattern to resulting injuries, fatalities or successes. A companion analysis of current emergency crew escape systems to include effects of individual components on total system performance will be conducted. These analyses will be correlated to define current system limitations and problems. Refined data on the mechanical properties of escape systems will continue to be measured, including aerodynamic properties, weight and balance, force, dimensional and functional. A computer math model depicting the detailed operation of the system is generated, validated and applied during analyses of various crew escape systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0024, LAMINATED WING STRUCTURES

J.B. MONFORT, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF140090)

There is a continuing need to reduce costs and improve the structural efficiency of advanced military aircraft. Conventional design and construction techniques have been virtually pushed to their limits, with further improvements dependent almost entirely upon development of new alloys and material systems. The objective of this effort is to evaluate innovative design and fabrication techniques wherein additional system advantage can be achieved through laminating aluminum sheets by adhesive bonding to reduce acquisition and life-cycle costs concurrently with weight savings and increased damage tolerance of primary airframe structure. The combination of economic and performance benefits realizable from improved airframes will provide the Air Force with a valuable tool for accomplishing the assigned mission with critical resources.

The Air Force Flight Dynamics Laboratory and the Air Force Materials Laboratory are jointly sponsoring contract F33615-75-C-5178 with General Dynamics/Forth Worth, MASIS accession number 678180, to design, fabricate and evaluate an adhesively bonded, laminated aluminum stub wing box based on the F-16 design criteria. As an integral part of this program three such wing boxes will be tested by the AFFDL, with non-destructive evaluation support from AFML, at Wright-Patterson AFB, for static strength, fatigue and damage tolerance. All data and the

wing boxes shall be returned to the contractor for analysis and inclusion of results in their final technical report.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0025, STRUCTURAL DESIGN CRITERIA SPECIFICATIONS AND DESIGN HANDBOOKS
G.E. MULLER, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF131590)

To improve structural integrity and performance and minimizing the technical and cost risk associated with system development, USAF specifications and design handbooks require continual re-evaluation and upgrading to eliminate state-of-the-art limitations. New and updated strength and rigidity data requirements for the MIL-A-8860 series of airplane specifications, the AFSC design handbook series 2-0 for aeronautical systems, the MIL-M-8856 strength and rigidity specifications for missiles and the AFSC design handbook series 3-0 for space and missile systems will be developed.

Design requirements are developed and updated to meet current system deficiencies and projected needs for new systems through in-house application of completed research and the initiation of new research, as required. Deficient requirements to be evaluated and updated include airframe crashworthiness, bird strike damage, statistical wind design samples, and structural design aspects for V/STOL, RPV, and experimental aircraft.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0026, J-79 COMPOSITE BLADE ENGINE QUALIFICATION
T.J. NORBUT, U.S. Air Force, Aeropropulsion Laboratory, *Dayton, Ohio* 45433 (DF453570)

To evaluate the endurance capability of J-79 B/Al blades prior to flight test.

The J-79 engine will be modified by the contractor to install first-stage B/Al blades. Endurance tests will be conducted by AFAPL. Pre and post calibration and periodic NDI inspection will be made.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0027, EMPIRICAL REPRESENTATION OF PARAMETRIC TURBINE ENGINE PERFORMANCE
J.R. RUBLE, U.S. Air Force, Aeropropulsion Laboratory, *Dayton, Ohio* 45433 (DF457530)

This effort will attempt to develop and/or modify multi-dimensional empirical procedures to represent engine performance (thrust, airflow, fuel flow) for a matrix of engine designs. Independent or input parameters to be examined will include bypass ratio, fan pressure ratio, overall pressure ratio, altitude, Mach number and power setting.

Currently, multi-dimensional empirical procedures are being developed by aircraft manufacturers to represent complex functions of several independent airframe parameters (wing loading, aspect ratio, sweep, thrust loading, etc.) for some desired dependent parameter (takeoff gross weight, range, combat performance, etc.). The need for this type of development is to reduce the amount of computer time required to evaluate preliminary aircraft system performance as a function of several (8 to 17) variables. The empirical procedures, when properly applied, can reduce preliminary design computer run time by an order of magnitude. In this effort, these procedures, or modifications of them, will be examined to determine if engine performance data can be represented empirically.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0028, X-24B FLIGHT RESEARCH AND PROJECT MANAGEMENT
D.R. SELEGAN, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF135000)

Current Air Force weapon system development activity does not provide for flight research with advanced aerospace vehicles which are designed uniquely for very high speed maneuvering and/or performance. This results in a lack of technical and piloting experience in futuristic vehicle configurations which are capable of transitioning the flight regimes from hypersonic to landing. The X-24B research vehicle is designed to partially fill this void by providing experience with an advanced configuration in the low supersonic to landing flight regimes. The specific objectives of this effort is to provide for a continuum of effort on the S-24B program by directing the flight research and project management support to the data gathering and reporting phases of the flight program. Preceding phases, including vehicle modification and flight envelope expansion, have been covered under work unit 14310204.

The data gathering and reporting phases of the X-24B program shall consist of approximately fifteen flights of the X-24B research vehicle during which data instrumental to the development of design criteria shall be gathered. Following the acquiring of the data it shall be reduced, correlated with theoretical and empirical predictions and reported on.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0029, AIR CUSHION SYSTEM DEVELOPMENT/TEST/EVALUATION
J.T. STEIGER, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF140720)

This effort supports the development of an air cushion landing system (ACLS) and other air cushion systems (ACS) for the launch and recovery of remotely piloted vehicles (RPV), which are projected to significantly reduce RPV life-cycle costs and to provide new expanded RPV mobility, and the development of an alternate aircraft takeoff system (AATS) which will enable conventional fighter aircraft to be rapidly launched after enemy weapons/bombs have caused extensive airfield damage. The objective of this effort is to accomplish in-house development, test and evaluation in support RPV ACLS, RPV ACS launch and recovery, and fighter aircraft AATS systems development. RPV ACLS and RPV ACS concepts are expected to reduce RPV launch/recovery costs by 80 percent and turnaround time by 90 percent, and provide uncelled RPV mobility. AATS will provide ability to immediately launch fighter aircraft after an enemy attack on their air base.

In-house development, test and evaluation work will be done in support of the following phases of development for the named systems: (1) RPV/ACLS preparation for and accomplishment of ground and flight tests, (2) RPV ACS concepts definition and initial development, and (3) fighter aircraft AATS concept definition and initial development.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0030, ANALYTICAL MODEL TO SIMULATE HELICOPTER TRANSMISSION
J. MCCOOL, S K F Industries Incorporated, *Norristown, Pennsylvania* 19406 (DA0K4524; DAAD05-74-C-0747)

To produce an analytical model capable of predicting steady-state dynamic and thermal performance of the transmission gears, bearings, shafts and casements concurrently under normal lubricated conditions, and predict the thermal transient and dynamic performance of the transmission following loss of primary lubrication. Incorporate means of automated evaluation of changes in configuration and materials.

Develop a power transmission analysis to obtain gear heat generation; extend model developed under DAADO 5-73-C-0011 to include flanged bearing applications; extend gear and bearing analyses to encompass planetary pinons special case; combine results to develop 2 shaft system and compare with experimental results previously documented; extend analysis to planetary gearbox transient and steady-state models.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

1.0031, STATIC CHARGE IN AIRCRAFT FUEL TANKS FOAM AND SURFACE COATING MATERIALS IN AIRCRAFT FUEL TANKS

A.W. BRIGHT, Univ. of Southampton, *Southampton, England, United Kingdom* (DF461770; AF-AFOSR-3373-77)

Investigate the electrostatic phenomena arising from use of reticulated polyurethane foams, surface coatings, and bladder cells in aircraft fuel tanks, and the effect of fuel electrical conductivity upon the charge generation rate.

Determine the dielectric properties of various aircraft fuel tank components such as foams, coatings, and fuel cell elastomers. Study charge relaxation of fuel tank materials. Conduct part-scale and full-scale tests to determine electrostatic behavior of foams, coatings, and fuel cell materials.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

1.0032, DESIGN AND ANALYSIS OF WINGLETS FOR MILITARY AIRCRAFT

A.L. DACOSTA, Boeing Company, *Seattle, Washington* 98108 (DF135490; F33615-75-C-3123)

The recently developed winglets appear to offer significant gains in aerodynamic performance by reducing aircraft drag. Potential benefits include improved range and/or reduced fuel requirements for military and commercial aircraft. The objective of this program is to analytically explore potential improvements from winglets and to fabricate winglet models for an existing wind tunnel model.

A recent investigation by the Boeing Company has established the procedures for analytically investigating winglets on aircraft. The contractor will conduct an analytical investigation of winglet concepts for the KC-135 and C-141 aircraft and will design and fabricate winglet models for testing on an existing KC-135 model. The contractor will make all modifications necessary to the KC-135 model to accommodate the winglet models. The contractor will conduct an investigation to determine the feasibility of winglets on the KC-135 flight vehicle. Wind tunnel tests of winglets on the KC-135 model will be conducted in government facilities at AEDC.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0033, ADVANCED FIBER REINFORCED THERMOPLASTICS (AFRTP) FOR AIRCRAFT STRUCTURES

J.T. HOGGATT, Boeing Company, *Seattle, Washington* 98108 (DF136020; F33615-76-C-3048)

Although significant advancements have been made in reducing the weight of aircraft structures through the use of advanced composites, further reductions in ownership and especially acquisition costs are potentially available through the substitution of thermoplastic matrix materials for the present thermosetting matrix materials (such as epoxies). Flat thermoplastic laminates can potentially be laid up and consolidated with highly automated processes, they can be stored without refrigeration as long as necessary (as can the thermoplastic adhesives) and they can then be postformed into complex shapes by applying heat and pressure. In addition, the thermoplastics can be welded in seconds either ultransonically or with an electromagnetic vibration welding technique. The objectives of the program are (1) to demonstrate the potential of advanced fiber reinforced thermoplastics (AFRTP) to reduce the fabrication and assembly costs of aircraft structures, (2) to demonstrate the structural integrity and durability of an AFRTP component and (3) to simplify the repair procedures and reduce the cost of maintaining advanced composite structures.

The approach to attaining the objective is to select a structural component from either an operational system or a future production system, redesign the component, develop the manufacturing and repair techniques, manufacture the component and thoroughly test it. The selection of the demonstration article is restricted to a component that has a definite potential for acquisition cost savings and/or reduction in maintenance costs on an operational or future production aircraft. This program is sponsored jointly by the Manufacturing Technology Division of the AFML and the Structures Division of the AFFDL.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0034, VERIFICATION ENVIRONMENTAL CONTROL SYSTEM DYNAMICS COMPUTER PROGRAM

A.J. LLOYD, Boeing Company, *Seattle, Washington* 98108 (DF138030; F33615-76-C-3100)

The instability of environmental control systems (ECS) causes adverse effects on the performance, reliability, and cost of other aircraft subsystems, and premature failure of ECS components. The objective of this effort is to validate the output of a new developmental transient analysis program through experimental test and training. The computer program is designed to predict system dynamics and thus leads to stable ECS control systems.

An existing ECS system will be fully instrumented and operated under various mission conditions so that its performance can be compared with that predicted by a developmental analytical program. Deficient models or characteristics will be corrected. Government engineers will be trained in use of the developmental program so that problems can be corrected prior to formal release. The product will be a fully verified transient analysis program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0035, DEVELOPMENT OF AN ANALYTICAL TECHNIQUE TO PREDICT AIR CUSHIONED LANDING SYSTEM/COMPONENT PERFORMANCE

M. WAHI, Boeing Company, *Seattle, Washington* 98108 (DF139640; F33615-77-C-3054)

This work unit supports the development and demonstration of air cushion landing systems, ACLS, for Air Force aircraft. Presently, a reliable analytical technique is not available for evaluating the performance of existing and new, proposed designs for ACLS components as a functioning part of a total flight vehicle system. The objective of this work unit is to develop and verify this needed ACLS prediction technique. Availability of the technique will significantly improve the effectiveness of, and increase the confidence level for ACLS development and demonstration. Realization of the dramatic improvements to flight vehicle mobility, self sufficiency, and response promised by ACLS ability to operate on any relatively level surface requires ability to evaluate ACLS performance as part of the total flight vehicle under consideration. The analytical technique developed will provide this needed capability.

The contractor will modify existing aircraft performance prediction techniques, as applicable, by substitution of conventional landing gear portions with ACLS system and subsystem routines. Where required, new routines will be developed. The resulting technique will be verified by comparing its results with existing ACLS ground and flight test data and towed ground test results from AFFDL work unit 13690211. As required, the technique will be modified to provide realistic results prior to its delivery to the Air Force. The resulting ACLS performance technique will be used for planning and evaluation of a flight demonstration of an ACLS for remotely piloted vehicles, RPVs, which is planned to start in FY 78.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0036, REANALYSIS OF FAA/NASA TEST DATA TO YIELD GROUND IMPEDANCE DATA

UNKNOWN, Man Acoustics & Noise Inc., *Seattle, Washington* 98103 (FA77WAI-766; FA160339 (TRAIS NO.))

The contractor shall use government-furnished data to (1) select a minimum of five (5) test runs which most clearly exhibit the effects of variations in ground impedance and (2) study meteorological, operational, and acoustic data to select tapes for further narrow band analysis. Selection criteria shall include the following: (1) Meteorological stability; (2) Aircraft altitude; and (3) Surface condition variability. Based on the results of Task I, a narrow band analysis of the tape recorded noise data for each selected test run from microphones 1.2 meters above the concrete taxiway and the surface shall be conducted.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, STRUCTURE AND CHEMISTRY OF SURFACES
R.P. MERRILL, Univ. of California, School of Engineering, *Berkeley, California* 94720 (DF041750; AF-AFOSR-2926-76)

AF function - propulsion and power generation systems for future AF weapon systems may depend upon synthetic fuels and surface induced combustion. Heterogeneous catalysis is an essential element for the synthesis of fuels and for the decomposition of propellants used to generate power and/or thrust. Deficiency-physical degradation of catalyst particles in monopropellant thrustors has become a limiting factor in engine life. Objective - this research has two major objectives. One is directed toward the theoretical and experimental studies of oxidation and hydrazine decompositions occurring on noble metal surfaces such as iridium. An equally important and collateral objective is to understand how oxide layers on aluminum and titanium surfaces withstand corrosive attack. How work contributes - hopefully better catalysts with longer lifetimes can be developed if enough is known about the basic surface chemistry of the catalytic process. Also improved inhibitor systems can be found to protect components and aircraft structural metal surfaces from corrosion damage.

An elaborate ultra-high vacuum scattering chamber will be used to make precise measurements of surface composition and structure, both atomic and electronic. The apparatus is sufficiently versatile to permit analysis by electron spectroscopy, LEED intensity measurements and both elastic helium scattering and reactive surface scattering techniques. Specific studies will be made of oxide layers on titanium and aluminum surfaces, the decomposition of hydrazine on iridium catalyst and selected oxidation reactions on platinum.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0002, INVESTIGATION OF REINFORCED PLASTICS FOR NAVAL AIRCRAFT ELECTROMAGNETIC WINDOWS
V.A. CHASE, General Dynamics Corporation, *San Diego, California* 92112 (DN590146; N00019-76-C-0405)

Investigation of reinforced plastics for naval aircraft electromagnetic windows. Develop composites for improved performance in aircraft radomes and antenna covers. Work requires experience in the fields of composite materials, particularly in polymer modification, and in electromagnetic window design and fabrication.

Investigate reactive monomers such as triallyl cyanurate for improving the strength and elevated temperature properties of polybutadiene laminates. Develop fabrication processing procedures to obtain maximum properties.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0003, LATTICE DYNAMICS OF HEATED NITRAMINES
T.B. BRILL, Univ. of Delaware, School of Arts & Sciences, *Newark, Delaware* 19711 (DF044710; AF-AFOSR-3055-76)

AF function - many future rocket propulsion systems will utilize nitramine propellants such as HMX. Deficiency - HMX is a complex organic molecule. The mechanisms of thermal decomposition of the molecule, the initial step in its combustion, are not understood. Objective - this research will determine the thermal decomposition mechanisms of alpha, beta, and delta phase HMX. How work contributes - the understanding gained from this work will permit the formulation of safer high-energy rocket propellants.

The molecular and lattice vibrational motions in crystalline nitramine propellants, particularly HMX, are to be studied by laser Raman spectroscopy. The crystalline polymorphs will be prepared and their spectra compared to theoretical predictions from factor group analyses. Spectral correlations with the known structural parameters in the alpha, beta and delta forms will be made with the ultimate intent of following the temperature dependence of the molecular and lattice motions as HMX heats toward thermal decomposition. It is intended that a more clear picture of the fundamental events occurring in the condensed phase of HMX can be gleaned from these studies.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0004, CRACK PROPAGATION IN AIRCRAFT STEELS
J.M. KRAFFT, U.S. Navy, Res. Laboratory, *Washington, District of Columbia* 20375 (DN480036)

This project will develop and define a comprehensive test methodology for assessing the susceptibility of high-strength materials to corrosion initiated and catalyzed failures.

Both static and cyclic loading spectrums will be employed to study crack initiation from the pre-existing notch in a compact tension specimen. The combined effects of various aggressive environments and loading conditions will be examined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0005, OPTICAL SURFACE STUDIES OF TITANIUM AND TI-AL ALLOYS WITH APPLICATION TO MECHANISM OF PASSIVITY AND NON-DESTRUCTIVE TESTING
J.R. STEVENSON, Georgia Inst. of Technology, School of Physics, *Atlanta, Georgia* 30332 (DF040080; AF-AFOSR-2773-75)

AF function - the Air Force is vitally interested in reducing costs and increasing reliability of mechanical and electronic systems exposed to the hostile environment of the atmosphere. Oxidation and corrosion of metals and alloys continues to be a major factor in operating and maintaining (O and M) aircraft systems. Opportunity - of all of the recent techniques to examine surfaces of solids, the use of synchrotron radiation spectroscopy provides the most sensitive and specific information about the atoms/ions and electrons on solid surfaces. Objective - this research will utilize an electron storage ring as a source of polarized electromagnetic radiation in the UV to IR region to study the surface stability of aerospace metals. How work contributes -this is a potentially new non-destructive evaluation (NDE) technique for general corrosion problems on aircraft structures.

Optical reflectivity, ellipsometric techniques and Auger spectroscopy will be used to monitor the chemical characteristics of the surface. Controlled atmospheres of oxygen and nitrogen will be used to produce well-defined changes in surface characteristics. The effects of these changes on the optical constants, Auger spectrum, and secondary electron emission ratio will be determined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0006, FRACTURE STUDIES OF HIGH-TEMPERATURE CERAMICS
D.L. JOHNSON, Northwestern University, Technological Institute, *Evanston, Illinois* 60201 (DF042280; AF-AFOSR-2920-76)

AF function - the performance and cost of jet engines are factors of high interest in any flight vehicle design. Opportunity - ceramic materials offer increased performance and efficiency through higher operating temperatures and greater thermodynamic efficiency. The key factor in using ceramic materials is their high-temperature strength but brittle behavior. Objective - this study will determine the resistance of ceramic turbine materials to impact damage at temperatures up to 1400 degrees C and in various gaseous atmospheres. How work contributes - a knowledge of the factors influencing impact strength will allow rational materials selection and optimum design parameters to be established.

An instrumented impact tester will be developed and calibrated in the initial experiments to obtain the surface energy, the critical stress intensity factor and the impact strength. Double-torsion-type samples of well-characterized glass will be used for calibration before working samples of SiC and silicon nitride are studied.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0007, CORROSION OF FIBER COMPOSITES WITH ALUMINUM ALLOY MATRIXES 14350-MS

M. METZGER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DA0E9290; DAAG29 77 G0025)

To investigate the principles governing the corrosion behavior of fiber composite materials with aluminum alloy matrixes when exposed to aqueous and atmospheric environments. Relevance - the Army evaluators cite relevance of this investigation to potential utilization of fiber-reinforced aluminum matrix composites in aircraft, missiles, equipment such as bridges, and in design concepts for general application of composite materials.

Research will include: (1) the galvanic effects of coupling graphite and alumina fibers to aluminum matrix will be studied to determine the electrochemical reactions and their kinetics as a function of sample geometry and environment chemistry, (2) effects of interface layers and identification of relation between selective attack at the interface and the interface phases present, and effects of interfacial layer thickness on corrosion behavior, and (3) study of crevicing and other localized attack which may be caused by incomplete fiber-matrix interfacial bonding.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

3.0008, PITTING IN ALUMINUM - 12821-MS

M. METZGER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DA0R5575; DAAG29 76 G0039)

To study the origins of film breakdown and mechanisms of pit initiation in aluminum and its dilute alloys the evaluators at MERDC, CERL, AMMRC, FA, and EA cite relevance to the mission areas of missiles, aircraft, armament, and armor, where pitting damage of aluminum alloys occurs in both aqueous and non-aqueous media, often leading to functional failures of such equipment.

1. Study film growth and breakdown and other electrochemical parameters pertinent to the mechanisms of pit initiation and growth, in order to formulate and evaluate models of these mechanisms. 2. Study the effect of addition of small concentrations of copper to pure aluminum to determine its effect on pitting mechanisms.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

3.0009, COMBUSTION MODELING FOR SMOKELESS AND ALUMINIZED PROPELLANTS

J.R. OSBORN, Purdue University, School of Engineering, *Lafayette, Indiana* 47907 (DF049400; AF-AFOSR-3381-77)

AF function - many advanced tactical rockets require smokeless propellants. Deficiency - accurate prediction methods are not available for determining the impact of propellant formulation variables upon system performance. Objective - this effort will provide a theoretical determination of the effects of both oxidizer particle size and size distribution on the combustion properties of ammonium perchlorate based composite propellants. How work contributes - provides quantitative guidelines for formulating stable, smokeless propellants.

Systematic variations in oxidizer particle size and size distributions will be made in modeled monomodal and bimodal ammonium perchlorate propellants. The steady-state burn rate, rate exponent and pressure sensitivity will be determined and compared with availability experimental data and with other prediction methods which do not account for the distribution of oxidizer particle sizes. Similar variations and comparisons will be made to obtain steady-state temperature sensitivities.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0010, MECHANISTIC MODELLING OF SOLID PROPELLANT COMBUSTION

M. IBIRICU, U.S. Army, Ballistic Research Labs., *Aberdeen Proving Ground, Maryland* 21005 (DA0K4436)

This investigation examines the effect of thermal influences on the steady burning rate of solid propellants.

Thermal stimulation is one of the few techniques to test and expand solid propellant combustion models. Increasingly more complex features will be incorporated into the model already formulated in order to determine the effect of the participation of the active condensed phase layer, high levels of stimulus and high combustion pressures. Homogeneous propellants will be studied first and composites later.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

3.0011, THE MEASUREMENT OF VIBRATIONAL INTENSITIES FOR INFRARED ACTIVE EXHAUST PLUME SPECIES FROM ADVANCED PROPELLANT ROCKET BOOSTERS

C.E. KOLB, Aerodyne Research Incorporated, *Bedford, Massachusetts* (DF048000; F49620-77-C-0075)

AF function - improved capabilities in early warning by detection of rocket plumes requires new knowledge of emissive properties of exotic fuel exhausts. Deficiency - quantitatively accurate calculations of short-wavelength infrared spectral radiance from boost-phase operational missiles require data on the IR absorption and emission of the rocket plume components from combustion of exotic propellants. Objective -obtain quantitative spectroscopic intensity data for the more important infrared active species expected in plumes from high-energy rocket boosters employing advanced propellants such as boron oxides and fluorides. How work contributes - the quantitative vibrational intensity data will be used to model the infrared rocket plume signatures from advanced propellants that would be observed from satellite, aircraft, or ground-based platforms.

A high-temperature flow reactor will be used to prepare the boron-containing species. Absorption measurements of these species will employ two complementary techniques including conventional, low spectral resolution measurements and high-resolution measurements employing a tunable diode infrared laser. The infrared absorption spectrum will be measured as a function of wavelength and as a function of temperature in the range 300-1500K. Pressure dependence from 1-400 Torr will be established. Species identity will be determined mass spectrometrically. The absorption coefficient will be calculated from these data. The spacing of absorption lines for certain species will be measured as a function of temperature, pressure, and wavelength for certain IR bands.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NC Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0012, ORGANOSILICON COMPOUNDS AND ORGANOSILICON POLYMER INTERMEDIATES

D. SEYFERTH, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (DF041490; AF-AFOSR-2917-76)

AF function - future Air Force flight operations require better environmental resistant materials. Deficiency - fluids and lubricants are needed as hydraulic fluids, coolants, engine oils and gyro fluids. Seals and sealants serve indispensable needs for fuel, liquid and air retention, and expulsion bladders in liquid rocket systems. Objective -a study of the synthesis and properties of new organosilicon compounds which may prove useful for these purposes. How work contributes - the work will provide new compounds and new methods of synthesizing organosilicon and related compounds.

The research will involve a study of the chemistry of silacyclopropanes, including ring opening reactions and dimethylsilylene extrusion, the chemistry of silacyclopropenes, and the Diels-Alder route to arylene-bridged disilanes suitable for organosilicon polymer preparation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0013, THERMAL DEGRADATION OF AIRCRAFT ENGINE ALLOYS

F.S. HODI, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4741)

To investigate the degradation of mechanical properties of aircraft engine alloys as a function of temperature and time. Specifically the interaction of creep and fatigue in titanium alloys will be studied.

Results on high-temperature fatigue of a commercial super alpha titanium alloy clearly demonstrate the detrimental effect of temperatures above 900 F on high cycle fatigue resistance. The first task in this project will more clearly define the region of creep-fatigue interaction for this and other alloys.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Materials & Mechanics Research Center

3.0014, POROUS AND FIBROUS STRUCTURAL MATERIALS

R. WEISS, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4814)

(a) To fabricate structural materials with vectored porosity. Pure lamellar flow over an air foil is important in flying efficiency (as well as noise reduction) while the reduction of turbulent flow at the trailing edge is important in noise reduction. Materials with controlled porosity can improve lamellar flow and reduce turbulence. (b) Fabricate natural fibers in novel configurations. Natural fibers such as wood cost only 1/20 of the energy of fabrication of an equal weight of aluminum. The use of natural fibers in novel composites can be very cost-effective to the Army.

(a) Fine tubing (or screening) will be arrayed in a fiber composite matrix to yield a structural material with given air impedence. (b) Wood metal laminates will be used to give a fireproof, lightweight structure that can be employed as a matrix to be drilled for a porous structure.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Materials & Mechanics Research Center

3.0015, RESEARCH ON CORROSION FATIGUE OF AIRCRAFT STRUCTURAL MATERIALS

D.W. HOEPPNER, Univ. of Missouri, School of Engineering, *Columbia, Missouri* 65201 (DF046650; AF-AFOSR-3178-77)

AF function - Air Force flight vehicles are fabricated of complex, mixed materials that each exhibit different reactions to environmental effects. In order to improve the serviceability of Air Force vehicles, research should now be done to better understand the role of selected environs during the phenomenalistic problem of corrosion fatigue. Opportunity - the combined effects of corrosion and fatigue on the loss of ductility and stiffness for aerospace aluminum alloys is of real concern to airplane designers for the long term. Research in this area would provide much-needed answers for questions vital to life-cycle problems of aerospace structures. Objective - this proposed effort will elucidate mechanisms of corrosion fatigue and lend insight into the corrosion fatigue phenomena that heretofore have not been available. Application of this information to materials engineering criteria, as well as fatigue life analyses, will aid in improving safety, reliability, maintainability and structural integrity of aircraft. How work contributes - this research would contribute to the AFOSR mission in the area of a continuing effort on problems relating to fatigue and fracture of metals in the field of structural materials mechanics.

Experimentally, this program will evaluate the effect of environment, r ratio, frequency, wave form and periodic overload for two aluminum alloys, 2024-T851 and 2124-T3. Analytically, the data will be modeled to approaches for prevention, prediction and alleviation of corrosion fatigue.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0016, STRESS-INDUCED HYDROGEN CONCENTRATION CHANGES IN TITANIUM

P.N. ADLER, Grumman Corporation, *Bethpage, New York* 11714 (DF043350; F44620-76-C-0071)

AF function - hydrogen embrittlement is a serious problem that causes mechanical property degradation in our most significant aircraft materials including steels, titanium, aluminum and nickel-base alloys. Hydrogen-related phenomena are suspect of playing key roles in the mechanisms of stress corrosion cracking, subcritical crack growth, hot salt corrosion, weld cracking, temper embrittlement, fatigue crack growth, and brittle fracture in general. Opportunity - stress-induced hydrogen concentration changes appear to be basic to this problem. Objective - this research will determine the extent and kinetics of the hydrogen redistribution that takes place in titanium alloys under the influence of elastic and plastic deformation. How work contributes - the various forms of hydrogen-related mechanical property degradation severely restrict the serviceability of our important aircraft materials. Basic understanding of the manner by which hydrogen acts to reduce mechanical strength and cause failures is important if we are to minimize and control these forms of attack.

Objective will be accomplished using Grumman's recently developed lithium nuclear microprobe (LNM) technique that enables in situ hydrogen concentration measurement in the surface of samples while under an applied stress. The results of these measurements will permit evaluation of the manner by which hydrogen participates in crack propagation and embrittlement.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0017, PICOSECOND LASER STUDIES OF EXCITED-STATE PROTON TRANSFER

K.B. EISENTHAL, Columbia University, School of Arts & Sciences, *New York, New York* 10027 (DF049630; AF-AFOSR-3407-77)

AF function - future Air Force flight operations in reconnaissance, communications, and other areas require new systems including lasers of varied wavelengths. Deficiency - research is needed to define methods of minimizing dye photochemical instabilities while maintaining the overall high efficiency derived from flashlamp pumped laser systems. Objective -to obtain information on the rates of excited-state chemical and physical processes in organic molecules which are dependent on excited-state hydrogen bonding and proton transfer phenomena. How work contributes - it will provide information on the kinetics of the various competing channels for energy and materials transformations which involve proton transfer and hydrogen bonding phenomena in organic molecules.

By taking advantage of the high time resolution made possible by picosecond laser techniques, the key steps in the evolution of an excited molecule through its various energy states and intermediate chemical species will be observed. Current ideas on energy relaxation and materials degradation will be examined so as to provide a better understanding of the effects of molecular structure, solvent interactions, and vibronic state of excitation on these fundamental processes in organic systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0018, MICROSTRUCTURAL PROCESSES IN THE DEFORMATION AND FRACTURE OF POLYMERS 13566-MS

J.C. LI, Univ. of Rochester, School of Engin. & Appl. Sci., *Rochester, New York* 14627 (DA0E9205; DAAG29 76 G0314)

To study microstructural mechanisms involved in the deformation and fracture of polymeric materials. Relevance - a wide variety of Army materiel, such as fuze components, aircraft canopies, canteens, and personnel armor are comprised of polymeric

materials which have exhibited premature unpredicted failures. The proposed research addresses subjects that will hopefully assist in explaining and circumventing such failures.

Study micromechanisms of deformation and fracture in metals and ceramics, including defect analysis, thermally activated deformation, and electron microscopy. Aspects of slip, including morphological details, and activation parameters for slip and craze formation would be studied. Finally, study mechanisms whereby additives and processing methods strengthen and toughen glassy polymers.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

3.0019, PHYSICS AND CHEMISTRY OF MATERIALS

J.A. BRUCE, U.S. Air Force, Rome Air Development Ctr., *Rome, New York* 13440 (DF902900)

AF function - development and improvement of electromagnetic materials and components used in C3 applications. Deficiency - need to characterize the structure and properties of EM materials and components to aid their development and improvement. Objective - to study the chemistry and physics of bulk and thin film materials, surfaces and device structures. How research contributes - this work is in direct support of both materials and device programs of this laboratory.

Defect properties such as dislocations of stacking faults, microtwins, impurities, etc., of components, device structures and their associated materials will be examined by X-ray topography and transmission electron microscopy. Scanning electron microscopy, optical microscopy and Auger spectroscopy techniques will be combined for both chemical and topological analysis of surfaces. Structured and chemical composition will be determined by both X-ray and electron diffraction.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

3.0020, TRANSPORT PROPERTIES OF METAL OXIDES IN THE PRESENCE OF SULFUR

H.S. SPACIL, General Electric Company, *Schenectady, New York* 12305 (DF040570; F44620-75-C-0043)

AF function - corrosion problems in aircraft jet engines are primarily related to the high temperatures at which the engines operate and the nature of the impurities in the combustion products. Alkali metal salts in the air combine with sulfur in the fuel to form sodium sulfate films which originate and sustain hot corrosion of superalloy turbine blades. Opportunity - certain trial and error coatings have had modest success; however, if the mechanism of ion transport can be established, a rational design of materials could be selected to provide increased life for turbine blades. Objective - this research seeks to determine the mechanism by which sulfur is transported across normally protective oxide scales, and how it influences oxidation. How work contributes - this research directly attacks the hot corrosion problem in current superalloy turbine engines. Reduced O and M costs and higher efficiency engines will ultimately result.

Electrical conductivity measurements will be made on single crystals and polycrystalline oxides in gaseous atmospheres at controlled oxygen and sulfur pressures. These results will be analyzed in terms of the growth rate, the defect structures and transport mechanisms in oxide scales.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0021, THE MECHANISM OF FRETTING FATIGUE CRACK INITIATION IN STEELS 12554-MS

D.J. DUQUETTE, Rensselaer Polytechnic Inst., School of Engineering, *Troy, New York* 12181 (DA0U5576; DAAG29 76 C 0006)

To clarify the basic mechanism underlying the initiation of cracking under fretting-corrosion-fatigue in steels. Fretting and its ramifications in fretting-corrosion-fatigue have been of serious consequence in engine and rotating structural components of Army aircraft and such phenomena may be responsible also for some classes of problems in high-rate-of-fire weapons.

Studies will be made of how certain variables such as frequency, microstructure, relative hardness of surfaces, environment, temperature, and contacting surfaces, partake in the process of fatigue initiation in steels. From fretting fatigue studies conducted at constant strain conditions, quantitative information will be derived which will form the basis of a comprehensive theory for fretting-corrosion-fatigue of metals and alloys.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

3.0022, QUATERNARY ALLOY FOR MICROWAVE MESFETS

J.W. HARRISON, Res. Triangle Institute, *Durham, North Carolina* 27709 (DF047650; F49620-77-C-0062)

AF function - microwave solid-state electronic devices are essential components of Air Force electronic countermeasures, communications, and signal processing systems. Opportunity - steady progress has been made in the development of high-performance microwave devices using III-V binary compounds. It is expected that still further improvements, especially in the quest for higher operating frequencies, can be obtained by developing III-V quaternary material systems for use in the fabrication of microwave devices. Objective - the objective of this research is to develop the GaInAsP quaternary material system so that it will be useful for the fabrication of superior microwave field effect transistor. How work contributes - this work will contribute to the state of the art in microwave materials by developing the promising GaInAsP material system.

Liquid-phase epitaxial techniques will be used to grow layers of GaInAsP on an InP substrate. Buffer layers will also be grown on some of the samples in order to shield substrate effects from the active layer. Various degrees of super cooling will be used in order to maximize the ordering of the quaternary alloy. The degree of alloy ordering and basic structural information concerning the layers will be obtained from transmission electron microscopy and X-ray diffraction techniques. These techniques will also be used to determine the structure of the alloy-substrate interface in order to insure that lattice matching has occurred. Schottky barrier profiling will be used to measure carrier density versus depth in the epitaxial layer. Resistivity and low field mobility will be measured as a function of temperature by Vander Pauw techniques. Velocity-field characteristics will be measured by observing low-repetition-rate current-voltage pulses and by a direct time-of-flight measurement. When device quality material can be grown, actual field effect transistor devices will be fabricated. A systematic search will be made to find suitable Ohmic and non-Ohmic contact materials. When devices are made they will be characterized by their static, low-frequency, and high-frequency characteristics. From all of the above steps it will then be possible to correlate device performance with the properties of the materials.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0023, DETERMINATION OF CONSTITUTIVE EQUATIONS FOR TITANIUM ALLOYS APPLICABLE TO SHEET METAL FORMABILITY

J.F. THOMAS, Wright State University, School of Science & Engin., *Dayton, Ohio* 45431 (DF047860; AF-AFOSR-3252-77)

AF function - the US Air Force has embarked on a long-term integrated computer-aided manufacturing program aimed at increasing industrial productivity and cost effectiveness of aircraft manufacturing. Opportunity - one component of this program is the development of analytical models for both material behavior and deformation processes which could be integrated into software systems for computer-aided design and manufacturing systems. The defining and measuring of sheet metal formability, and the determination of constitutive equations for high-strength alloys are important to the success of the above program. Objective - this research will establish the range of conditions for which a constitutive equation can be determined, and identify the history-dependent state variables for the commonly used titanium alloy Ti-6Al-4V. How work contributes - this research will parallel work on formability criteria based on calculated forming limit

curves as well as work on sheet metal process modeling being undertaken within the Metals and Ceramics Division of the Air Force Materials Laboratory.

Load relaxation studies will be utilized to determine the range of conditions for which a constitutive equation can be identified. Resulting flow characteristics will be analyzed within the constitutive equation framework developed by E.W. Hart which is based upon one or more structure-dependent state variables. One objective of the work will be to determine the effect of phase distribution in the two-phase Ti-6Al-4V on material parameters and structure-dependent state variables within the constitutive equation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0024, INFLUENCE OF COMPOSITION AND MICROSTRUCTURE ON THE LOW-CYCLE FATIGUE RESISTANCE OF TITANIUM ALLOYS

J.C. WILLIAMS, Carnegie Mellon University, Inst. of Technology, *Pittsburgh, Pennsylvania* 15213 (DF042420; AF-AFOSR-2925-76)

AF function - titanium and its alloys have been of considerable interest to the Air Force because of very favorable strength-to-weight characteristics at temperatures from cryogenic up to 800 degrees F, and resistance to attack by many chemicals. Potential applications for skins, structural and engine components of high-performance aircraft, cryogenic fuel storage tanks for missiles, and tubing for transporting corrosive fuels all emphasize the available materials roles for titanium alloys. Opportunity - the occurrence of strain localization due to the development of localized regions which are plastically unstable results in severe reductions in fatigue and ductility of many high-strength structural materials including certain titanium alloys. Thus, the critical strain for fracture can be locally surpassed at very low average macroscopic strains, since such instabilities can lead to premature failure. Objective - this research will provide an improved understanding of the metallurgical factors which control strain localization, and the relationship of strain localization phenomena to low-cycle fatigue performance of alpha-Ti alloys. How work contributes -the use of alloys which exhibit the tendency for strain localization requires particular caution since the tolerance for local stress concentrations is reduced.

The program consists of two interrelated tasks: (1) the role of alloy composition in controlling deformation behavior and the relationship between deformation behavior and low-cycle fatigue performance, (2) the role of microstructure on deformation behavior and low-cycle fatigue performance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0025, WEAPONRY - THE COMBUSTION INSTITUTE

J.P. LONGWELL, Combustion Institute, *Pittsburgh, Pennsylvania* 15219 (DN023116; N00014-76-G-0041)

This work unit, giving partial support to the Combustion Institute, will be instrumental in providing interaction between investigators involved in fundamental combustion research and Defense Department groups (including contractors) concerned with utilization of combustion technology in aircraft, missile and armament applications. As part of the energy utilization project, the effort nonetheless supports all projects under the energy conversion subelement, particularly the tasks on energy release processes, jet propulsion processes and to some extent the task on electrical power generation.

Activities of the Combustion Institute during this period will include (a) organization and operation of the Sixteenth Symposium (international) on Combustion, 15-21 August 1976, at MIT; (b) publication, in book form, of the symposium proceedings; (c) support and coordination of activities of regional sections of the Combustion Institute; and publication of the journal, 'Combustion and Flame.'

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0026, SOLID PROPELLANT ADDITIVES FROM PENTABORANE-9

A.J. LEFFLER, Villanova University, School of Liberal Arts & Sci., *Villanova, Pennsylvania* 19085 (DF048380; AF-AFOSR-3301-77)

AF function - future Air Force needs include rockets with improved performance, reliability and durability for a broad range of mission applications. Deficiency - progress in solid propellant technology requires additional basic understanding and acquisition of materials better tailored to propulsion goals. Objective - the purpose of this research is to find suitable means of converting pentaborane-9 into stable solid propellant additives. How work contributes - the work will provide methods for converting presently available chemical substances into useable additives.

Two approaches will be studied. The first is either to convert pentaborane into reactive species by electrochemical oxidation or reduction, or to react the pentaborane with electrochemically generated species. The second is to study the incorporation of pentaborane into metalloorganic structures by either introduction of the B5H8 group into an existing structure such as ferrocene, or by incorporating the B5H8 group into components and building the final structure from these components.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0027, BASIC RESEARCH ON FUEL MIST FLAMMABILITY AND INHIBITION THEREOF 14208-CX

W.D. WEATHERFORD, Southwest Research Institute, *San Antonio, Texas* 78228 (DA0E9140; DAAG29 76 C 0013)

To study the mechanisms of mist flammability phenomena to resolve ambiguous information on ignition requirements, flame speeds, and flammability limits of multicomponent fuels dispersed in such heterogeneous systems. Relevance - the Army has a need for methods for reducing fire vulnerability of aircraft turbine fuel. The proposed studies should provide definitive results which would lead to improved in-flight fuel fire resistance and post-crash fire resistance.

Appropriate experimental devices and techniques will be developed for quantitative determination of the aforementioned flammability characteristics in initially non-turbulent systems. Burner studies of mist flammability phenomena and antimist agent influences will be initiated.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, SURVEILLANCE - DEVELOPMENT OF TECHNIQUES FOR DETECTION OF FAINT SOURCES

H.D. ABLES, U.S. Navy, Observatory, *Flagstaff, Arizona* 86001 (DN046006)

Electronographic image tube techniques are being developed for the purpose of increasing sensitivity and area of acquisition for applications such as surveillance of deep space satellites and probes.

Laboratory development and actual observations with the 61-inch and 40-inch reflectors at the Flagstaff station are performed. The image tubes are manufactured in-house and continuous programs of improving sensitivity of photocathodes and increasing efficiency of information retrieval are carried out.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Observatory

4.0002, DYNAMICS OF EXPLOSIONS IN FUEL-AIR MIXTURES

A.K. OPPENHEIM, Univ. of California, School of Engineering, *Berkeley, California* 94720 (DF045960; F49620-77-C-0001)

AF function - advanced chemical explosive weapons, weapon delivery and defense, close air support, aircraft component vulnerability and survivability. Deficiency - insufficient understanding of basic mechanisms and dynamic processes of initiation, propagation, attenuation and quenching of blast waves, flames and detonations in reactive media and lack of realistic guidelines for predicting properties and blast potentials of unconfined homogeneous and heterogeneous explosions and for evaluating the vulnerability of aircraft components, (e.g., fuel tanks) to flames' blast and detonation waves. Objective - to formulate mathematical models realistically describing the mechanisms responsible for initiation, propagation, and attenuation of unconfined cloud detonations and non-ideal blast waves in reactive media. How work contributes - will provide additional understanding of initiation, propagation, attenuation and quenching mechanisms of flames, blast and detonation waves in reactive media not now available, and will contribute to establishing realistic guidelines for developing advanced high-power chemical explosive (FAE) devices, effective flame and detonation arrestors, and stable operating air-breathing and hybrid propulsion engines.

This program involves investigation of wave dynamic phenomena in explosive fuel air mixtures, with emphasis on auto ignition processes. Objective is to determine interrelation between the high rates of heat release and the nonsteady gasdynamic phenomena in such media. Included are (1) identification of prominent physical and chemical parameters governing the explosion processes, (2) determination of effects of additives on blast wave formation headed by detonation fronts, (3) development of computational models for the analysis of the initiation, combustion and explosion process, and (4) establishment of criteria for explosive ignition. Experiments will be performed in shock tubes and explosion vessels, using primarily hydrocarbon-oxygen mixtures, at atmospheric or sub-atmospheric pressures. Gasdynamic properties of nonsteady flow fields under investigation will be observed by Schlieren and interferometer techniques using high-speed pulsed ruby laser light sources. Experimental data will be interpreted on the basis of computational techniques, blast wave theory, nonsteady gasdynamics, and chemical kinetics.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0003, TURBULENCE MEASUREMENTS BY RAYLEIGH SCATTERING

L. TALBOT, Univ. of California, School of Engineering, *Berkeley, California* 94720 (DF038830; F44620-76-C-0083)

AF function - aerospace vehicles, air-breathing propulsion, weaponry. Deficiency/opportunity - experimental study of turbulent flows associated with aerospace vehicles and their propulsion systems has been hampered in the past by the lack of non-intrusive measurement methods suitable for measuring all the desired quantities. Hot wires have produced much important information, but they do disturb the flow, and they cannot survive many of the harsher environments in which it is desired to make measurements. The laser Doppler velocimeter (LDV) techniques promise a new dimension in turbulence measurements, but these can measure flow velocity only. Knowledge of turbulent fluctuations of temperature, gas composition, and gas density, as well as pressure and velocity, would contribute to the body of known information about turbulence and diminish the amount of speculative assumption that goes into scientific and engineering work with turbulent flows. The proposed work explores the recent innovation in gas velocity and temperature measurement by Rayleigh scattering, combining it with LDV or hot wire methods, to obtain data on both the temperature and velocity turbulence in hostile gas flow environments. Objective - to provide a practical demonstration of the use of Rayleigh-scattered laser light for investigating turbulent flows in a severe environment, and at the same time to gain knowledge of the interaction of turbulence with exothermic reactions or other heat releasing processes in gas flows. How work contributes - many modern applications of gas dynamics involve flows in which chemical reactions occur. It is well known that turbulence in a flow can be amplified by an exothermic chemical reaction. A quantitative correlation between these phenomena could serve to clear up some troublesome questions about entropy layers, flame zones, and radiating or absorbing flows.

A stabilized flame zone in pre-mixed hydrogen-air or propane-air mixtures will be observed by the Rayleigh scattering method, whereby the temperature and velocity fluctuations are deduced from the Doppler shift and Doppler broadening of a suitable laser-produced monochromatic beam of light. The fluctuations will be correlated to pre-existing turbulence in the fuel mixture, which will be determined from LDV measurements and controlled by upstream grids in the flow passage. (Text abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0004, THEORETICAL AND EXPERIMENTAL ANALYSIS OF ALKALINE ZINC BATTERIES

D.N. BENNION, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (DF043860; F44620-76-C-0098)

AF function - communications, flight operations, and aircraft subsystems depend on auxiliary battery sources for power. Deficiency -longer life, lighter weight, and higher energy-density batteries are needed to meet Air Force requirements. Objective - results from this research will assist in the prediction and measurement of current density distributions, concentration distributions and their relationship to electrode design, convective flow related to membrane separator properties, and gasing of the electrodes. How work contributes - the goal of battery modeling techniques is to relate a battery's physical characteristics to its performance in service. Such a capability allows battery users to select or design a battery to specific performance requirements. The enhanced understanding will provide the battery developer with new approaches to the improvement of battery components.

To describe theoretically the current distribution in a zinc-nickel oxide (or silver oxide) electrochemical energy storage cell and to compare the predictions with actual experiments. Emphasis will be given to prediction and measuring current distribution and concentration distributions, and to determine their relation to cell potential, potential distribution, electrode structure, and other geometric and operating characteristics. Evolution of hydrogen and oxygen at their respective electrodes, and the rate and mechanism by which they are removed will be considered.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0005, MECHANISMS OF MAGNETOPLASMADYNAMIC ARC JET ACCELERATION PROCESSES

G.L. CANN, Technion Incorporated, *Newport Beach, California* (DF037860; F44620-74-C-0017)

AF function - satellite surveillance, communications and navigation, advanced electric propulsion engines. Deficiency -insufficient fundamental understanding of basic mechanisms and physical processes of low-temperature plasma generation and acceleration associated with using the atmospheric environment as an arc jet propellant source for an MPD arc operated space thruster and lack of experimental evidence and realistic guidelines for defining capabilities and predicting system performance. Objective - to understand and develop theoretical and analytical models accurately describing the plasma generation, acceleration and loss phenomena associated with the MPD arc operated space electric ramjet using ambient atmosphere as the propellant source (i.e., SERJ), to obtain critical experimental data to evaluate the analytical models and the SERJ concept. How work contributes - will provide additional understanding and realistic analytical modeling of the plasma generation and acceleration processes via MPD arcs using ambient atmosphere as propellant and will contribute to the technology base required for realistic evaluation and development of the SERJ concept as an effective and efficient plasma space propulsion engine.

Theoretical and experimental studies of plasma generators and acceleration phenomena associated with the use of the ambient atmosphere as the propellant source for an MPD arc operated as a space electric ram jet (SERJ) will be carried out. Processes producing strong interaction between the accelerating discharge and ambient medium will be investigated. Fundamental studies of ion production, acceleration and electrode attachment mechanisms in the relevant pressure and current density regime will determine the interaction parameters between the discharge

and tenuous atmosphere as the parameters affecting the power loss and electrode lifetimes in SERJ-MPD arc devices. Techniques of utilizing the ambient charged particle in the ionosphere for charged particle and thrust production will be investigated. The adsorptive collection of air on electrode surfaces will be investigated to determine its influence upon electrode performance. The effectiveness of using a combination of the self-magnetic field with a solenoidal magnetic field operating in a quasi-steady mode to produce the accelerating force will be studied in terms of the mass and energy utilization efficiency. (Text abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0006, COMMUNICATION - PLASMA INTERACTION EXPERIMENTS AT SYNCHRONOUS ALTITUDE

J.B. REAGAN, Lockheed Missiles & Space Co., *Palo Alto, California* 94304 (DN675180; N00014-76-C-0444)

Energetic charged particles in the earth's magnetosphere cause potentially damaging voltages to build up on spacecraft such as the planned Navy fleet SATCOM, and when precipitated into the ionosphere disrupt naval communications, navigation, and radar systems performance. The objective of this research is to study the origin, injection, acceleration, transport of these particles, together with their interactions with electromagnetic waves. This will lead to an understanding of the spacecraft charging phenomenon, and also to wave particle interactions, which could lead to a new communication mode by controlled modulation of particle precipitation.

Three sets of experimental equipment are being designed and fabricated for launch on the P78-2 (SCATHA) satellite, whose primary mission is the study of spacecraft charging: a light ion mass spectrometer to measure the density, temperature, composition, and plasma flow characteristics of the ambient cold plasma; an energetic ion mass spectrometer to measure ion fluxes, composition, energy spectra and pitch angle distribution of the epithermal plasma; and a high-energy particle spectrometer to measure the flux, spectra, and pitch angle distribution of energetic electrons, and of protons and alpha particles during solar particle events.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0007, COMMUNICATIONS - MAGNETO-IONOSPHERIC PLASMA

E.G. SHELLEY, Lockheed Missiles & Space Co., *Palo Alto, California* 94304 (DN575039; N00014-75-C-0099)

High-energy particle precipitation into the ionosphere is the major cause of scintillation of naval communication satellite signals; disrupts HF, VLF, and ELF communications and navigation; and results in auroral clutter. An understanding of particle acceleration and precipitation mechanisms is required for prediction of propagation during disturbed periods. A previous experiment detected large fluxes of energetic oxygen and helium ions and protons precipitating during magnetic storms. The presence of oxygen implies an ionospheric acceleration mechanism.

An ion mass spectrometer and a multichannel electron spectrometer will be flown on a low-altitude polar orbit satellite, and will measure ion mass, and particle flux, energy, and pitch angle distribution of ions and electrons from 0.1 to 30 KeV. Comparison of oxygen or other heavy ions with proton data will yield information on mass dependent particle acceleration processes. Active experiments involving chemical releases by DNA, NASA, or the Max Planck Institute may be performed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0008, WEAPONRY - ULTRA HIGH SPEED PHASE MODULATOR/DEMODULATOR IN INTEGRATED CIRCUIT PACKAGE

D.H. CLAXTON, Thompson Ramo Wooldridge Inc., *Redondo Beach, California* 90278 (DN675290; N00014-76-C-0570)

This work seeks to reduce the size, weight, and power supply requirements of modulators/demodulator devices by a factor of 100 such that they may be used in missiles, remotely piloted vehicles, and satellites used by the Navy.

A new logic technology based on the extremely rapid, but controllable, transfer of electron charge carriers between conduction bands in the gallium arsenide semiconductor is exploited. The system architecture of the transferred electron logic device (TELD) reduces component count by a factor in excess of ten over other logic architectures. Logic and as well as or gates will be used at RF carrier frequency toggle speeds.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0009, PROCURE AND ASSEMBLE A COMPLETE AND OPERATING OMEGA/VLF SIGNAL MONITOR SYSTEM

UNKNOWN, U.S. Navy, Ocean Systems Center, *San Diego, California* 92152 (FA77WAI-735; FA160017 (TRAIS NO.))

The objective is to procure, modify, and assemble the equipment necessary for a complete and operating Omega/VLF Signal Monitor System. The system shall include the developed computer program in either Basic or Fortran Language for use in the computer unit. The Omega Monitor System is intended to provide messages to aviation users on the conditions of Omega signals along air routes in a geographic area.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

4.0010, AEROPHYSICAL ASPECTS OF GAS AND PLASMA FLOWS

I.I. GLASS, Univ. of Toronto, *Toronto, Ontario, Canada* (DF013470; AF-AFOSR-3303-77)

AF function - aerospace vehicles, weaponry. Deficiency/opportunity - the grantee is performing research in a number of physical gas dynamic problems related to very high temperature boundary layers, to excitation processes in gas lasers, and to physical explanation of observed sonic boom propagation properties. These problems are basic to gliding reentry aerodynamics, supersonic flight, and future laser technology. Objective - to use explosive-driven implosions to achieve gas pressure and temperature of a million psi and a million degrees K, to measure krypton-krypton excitational cross sections from ionizing shockwave structure, to clarify questions about regular reflection, Mach reflection, and double Mach reflection of shock waves, and to completely resolve the problem of explaining why far-field n-wave shocks are 1000 times thicker than predicted by previous theory. How work contributes -this research will provide basic information about the behavior of gases under extreme conditions, about the collisional excitation process, about shockwave stability, propagation and reflection, and the influence of vibrational excitation on the thickness of n-wave shocks.

Graduate and post-doctoral experimental and theoretical research on the above topics will be pursued in the grantee institution.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0011, GPS INDEPENDENT STABILITY AND CONTROL ANALYSIS

T.J. ELLER, U.S. Air Force, Astronaut. & Comput. Sc. Dept., *Colorado Springs, Colorado* 80840 (DF281800)

AF function - strategic offense, strategic defense, close air support, interdiction. Deficiency - lack of global navigation system of required accuracy. Research - independent stability and control analysis of GPS satellite. How research contributes - insures an independent evaluation of the vehicle contractor's stability, control, and dynamic analyses to assure satisfactory dynamic performance of the vehicle. Abstract - this analysis is being done by Honeywell Systems and Research, Inc., and USAFA Department of Astronautics and Computer Science in compliance with the Samso Commander's policy (pamphlet 800-4). USAFA tasks, to run through first launch, Jan 77, include: (1) verification of the mass properties of the vehicle, (2) develop-

ment of magnetic torque models for the Honeywell/USAFA simulation, and (3) simulation and analysis of all attitude dynamics and control activity for on-orbit operations, including a failure modes analysis. USAFA has received project order funds from Samso/YEC since Jan 75 in support of this effort.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Frank J. Seiler Research Lab.

4.0012, COMPUTER-GENERATED VISUAL DISPLAYS FOR TRAINING

J.L. BOOKER, U.S. Navy, Computer Laboratory, *Orlando, Florida* 32813 (DN494005)

Develop CGI applications in both TV and calligraphic display formats, and identify advantages and limitations of each type when applied to training applications such as carrier landing, weapon delivery, and general aerial maneuvers. Significant savings can be achieved where calligraphic displays can replace the more general and expensive TV-type CGI. Investigation will include interactive simulator control with on-line control and replay of trial scenarios, stylized sensor (radar/sonar) displays, and simulated operational displays.

(Jan 76 - Jul 76) contract award for procurement of a real-time continuous-tone TV CGI system was made on 20 May 1976 to General Electric Co., Daytona Beach, Florida. Delivery is scheduled for October 1978. An in-house report, IH270, describing the math model and program changes required to provide simulation of fixed perspective zoom lens simulation of range changes is being prepared for publication.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Training Equipment Center

4.0013, COMBINING IMPATT DIODE CHIPS

W. COX, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (DF099860; F33615-75-C-1020)

To develop techniques for interconnecting a number of avalanche diodes in a series-parallel array, such that the array of diodes behaves like a single diode. The intent is to increase power levels, facilitate impedance matching, and increase bandwidth capabilities significantly beyond that possible with single diodes. An added advantage can be gained by optimizing the input DC voltage to simplify power supply requirements.

The approach will be to interconnect the chips electrically in series-parallel arrays such that all diodes are in parallel thermally. The diodes will therefore be mounted on a common substrate which is electrically insulating and of high thermal conductivity, such as diamond or beryllium oxide. Stabilization networks will be included in the connecting circuitry.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0014, TRANSITION TO TURBULENCE IN SHEAR LAYERS

M.V. MORKOVIN, Illinois Inst. of Technology, School of Engin. & Phys. Sci., *Chicago, Illinois* 60616 (DF046500; F49620-77-C-0013)

AF function - improved aerospace vehicles. Opportunity - increase understanding of the transition to turbulence in shear layer phenomena. Objective - prepare a self-contained comprehensive and reliable guide to the phenomenon of transition to turbulence in shear layers for use by research workers and designers. How work contributes - it will provide an understandable, comprehensive, and reliable guide on transition to turbulence in shear layers for designers to use in future aerospace vehicle designs.

All information presently available in the open literature will be collected, analyzed and organized into a self-contained monograph on transition to turbulence in shear layers. The text will identify what is considered solid, established information, what are tentative concepts based on limited evidence, and what are conjectures and speculations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0015, AN/ARC-164 TRANSMITTER STUDY

G. JOHNSON, Magnavox Company, *Fort Wayne, Indiana* 46804 (DF737300; F30602-77-C-0076)

The objective of this effort is to study, investigate, and analyze the problem of spurious and broadband noise outputs associated with the new generation of solid-state UHF replacement radios. This effort will be directed at developing the technology required to reduce these unwanted outputs to -90 DBM and -125 DBM/Hz, respectively. This technological advance is required to provide electromagnetic compatibility between this type of equipment and ultra-low-noise receiving systems used on Air Force command and control aircraft.

An RADC in-house measurement program has verified that the Magnavox AN/ARC-164 solid-state transmitter generates the highest level of spurious and broadband noise outputs of all the new replacement radios. For this reason it was picked as the candidate for this study. The approach is to award a 9-month sole-source contract to Magnavox to study, investigate and analyze this severe EMC problem, and to develop the technology required to achieve electromagnetic compatibility. This technology will be applicable to other solid-state broadband replacement radios.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0016, BALLISTIC STRUCTURAL DAMAGE OF AIRCRAFT

J.M. SANTIAGO, U.S. Army, Ballistic Research Labs., *Aberdeen Proving Ground, Maryland* 21005 (DA0N4441)

The objective of this task is to develop analytical methodologies to predict the structural damage inflicted on in-flight maneuvering aircraft by blast and fragments. The methodologies would be developed for ultimate use as tools for vulnerability assessment and hardening redesign.

The most advanced finite-element structural dynamics program capable of treating the nonlinear anelastic transient response of aircraft-like structures will be acquired. It will be modified and specialized as needed to treat damage effect and flight loads on typical fuselage bays and wing sections.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

4.0017, ULTRASONIC DETECTION OF FATIGUE DAMAGE IN AIRCRAFT COMPONENTS

R.E. GREEN, Johns Hopkins University, School of Engineering, *Baltimore, Maryland* 21218 (DF043500; F44620-76-C-0081)

AF function - Air Force advanced aerospace vehicles require increased design emphasis on durability and inspectability. New techniques for nondestructive evaluation (NDE) are needed to reduce operation and maintenance costs. Deficiency - cost factor estimates for advanced Air Force systems are quite expensive and, as such, not desirable. New inspection techniques coupled with fracture mechanics analysis methods are needed to effectively reduce Air Force serviceability costs. Objective - the object of this research is to extend the state of knowledge involving ultrasonic attenuation and acoustic emission applications and their attendant correlations with hardware used in typical Air Force flight systems. How work contributes - this research contributes to the Air Force program seeking to enhance the reliability and durability of aerospace structures.

Techniques of ultrasonic attenuation and acoustic emission will be used in this research. Experimental techniques and monitoring systems will be investigated to correlate defect initiation and growth characteristics. At a later date studies will evaluate the differences that exist between laboratory specimens and actual aircraft components.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0018, SPARE PARTS FOR NLM SATELLITE BIOMED COMMUNICATION SYSTEM

UNKNOWN, Varian Associates, *Hyattsville, Maryland* 20781 (N01LM74718 (CONTRACT))

SUPPORTED BY U.S. Dept. of Health Education & Welfare, National Inst. of Health, National Library of Medicine

4.0019, CROSSTIE MEMORY

L.J. SCHWEE, U.S. Navy, Res. & Technology Department, *Silver Spring, Maryland* 20910 (DN334229)

There are two objectives of the crosstie memory program. One is to demonstrate the feasibility of a high-performance, high-density, low-cost, nonvolatile memory suitable for military use on vibrating, moving platforms. The second objective is to demonstrate that the memory is economically attractive for commercial uses. The crosstie memory should be faster, cheaper and less temperature sensitive than bubble memories. Storage density should be greater than 10(6) bits/in(2), potential speed greater than 10(8) bits/sec and temperature range from -50 to 150C.

Since all the necessary functions have been demonstrated, the next phase of the development program calls for the fabrication and optmization of experimental memories.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0020, INTRUDER DETECTION FEASIBILITY STUDY

S.J. ROCHEFORT, Northeastern University, School of Engineering, *Boston, Massachusetts* 02115 (DF903050; F19628-77-C-0142)

AF function - security. Deficiency - need to protect entities such as airplanes, airbases, airstrips and vehicles. Objective - to develop a radio frequency intruder detection system. How research contributes -the RF detection system will be adaptable to use by any other goverment agency, military and nonmilitary.

The investigation consists of three phases: 1) A theoretical study on the scattering and absorption of electromagnetic energy by humans. 2) A laboratory and field experiment to validate theoretical conclusions and gather preliminary experimental data. 3) A full-scale field experiment of the entire detection system. Not only will the system be tested for its response to human intrusion but also its reaction to false alarm triggering by physical, electrical and environmental conditions. Concurrently with the field tests will be development of the received signal processing portion of the overall system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0021, LASER-INDUCED MATERIAL DAMAGE

N. BLOEMBERGEN, Harvard University, School of Engineering, *Cambridge, Massachusetts* 02138 (DF041230; F44620-75-C-0088)

AF function - high-power lasers in the spectral regions from the far infrared into the ultraviolet will have a great impact on future Air Force and DoD systems such as laser radar, trackers, designators, communications and weapons. Deficiency - fundamental studies are needed to determine the interaction mechanisms between laser radiation and various materials. Such research is needed in order to find materials used in the laser construction which will stand up to the flux densities envisioned for future laser systems. Objective - the objective of this research is to study the physical mechanisms which are involved during laser-induced breakdown of optical materials. How work contributes - this objective will be accomplished by obtaining data on the damage mechanisms occurring with ultraviolet laser radiation and also on the laser-plasma interactions which take place under controlled conditions.

The first portion of the proposed work will involve interactions in the ultraviolet region. Dielectric breakdown data for windows and mirror coatings will be obtained for the third and fourth harmonic of the neodymium-YAg laser operating at a fundamental wavelength of 1.06 microns. Two photon absorption cross sections in the near and vacuum ultraviolet will be obtained for UV window materials including ADP, KDP, quartz, LiF, NaCl, KCl, CdF2 and BaF2. This study will be accomplished by again using harmonics of the Nd-YAg laser. The pulse will be split into two parts with one beam focused directly on the sample and the other on a cell containing water. The water cell will provide a quasi-continuous spectrum of radiation which will then also be focused on the sample. The quasi-continuous spectrum will then be analyzed in order to observe selective absorption at the laser frequency. In the area of laser-plasma interactions, an ultrashort carbon dioxide laser pulse will be used to indirectly measure the speed of propagation of the ionization front in various gases as a function of pressure and intensity. Such measurements will help determine the optimum operating parameters for the laser breakdown switch. Similar short CO2 pulses will be used to study the nonlinear properties of plasmas in narrow bandgap semiconductors (e.g., InSb). This set of experiments gives insight into the problems of plasma formation and materials damage and could lead to a useful solid-state plasma shutter of very high speed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0022, FRACTURE MECHANICS AND BUCKLING

B. BUDIANSKY, Harvard University, School of Engineering, *Cambridge, Massachusetts* 02138 (DF049000; AF-AFOSR-3330-77)

AF function - aerospace vehicles require improved understanding of fatigue and fracture processes so that designs of enhanced durability can be achieved. Deficiency - current design methodologies for structural failure are empirical in nature and result in premature failures and excessive inspection and space parts costs. Objective - the principal objective of this research effort is to understand the behavior of cracks and flaws in metallic structures. In particular, this research will investigate the influence of nonlinear material behavior in the vicinity of cracks on crack growth and fracture characteristics. How work contributes - based upon a deeper knowledge of crack behavior, improvements in airframe and engine designs can result which reduce Air Force cost of ownership.

This research is theoretical in nature. Theories will be studied which improve the predictive capability of establishing stress concentration factors when material plasticity is involved. These studies will include plasticity effects on stationary and growing cracks. In addition, plasticity effects on fatigue crack growth will be investigated and retardation factors investigated. Finally, within this framework the influence of creep on crack growth will be examined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0023, OFF-DESIGN WAVERIDER FLOW FIELDS

J.R. BARON, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DF048600; F49620-77-C-0090)

AF function - aerospace vehicles. Opportunity - waveriders are a special class of vehicles which utilize favorable interference in their optimization. Such optimization of favorable interference is generally 'point-optimal' design and off-design performance can degrade to the point of prohibiting the use of the concept. This effort proposes to concentrate on the off-design flow fields of this rather elemental geometry vehicle and thereby provide insight into the off-design behavior, not only of the waverider concept, but of favorable interference phenomena in general. Objective - develop a method which is capable of accounting for the off-design behavior of a generalized waverider configuration. How work contributes - this study is concerned with how to control the enhanced interference effects that are known to be achievable with finite span geometries in so-called on-design situations. The focus of this effort is on flow field behavior and predictions. From such information performance changes should be apparent when there is a departure from the ideal (on-design) condition.

A theoretical evaluation of inviscid flow fields for off-design waverider configurations. The sensitivity of off-design behavior to both flow and geometric parameters will be sought as a measure of overall waverider performance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0024, STANNIC OXIDE SEMICONDUCTOR STUDIES
C.G. FONSTAD, Mass. Inst. of Technology, School of Engineering, *Cambridge*, *Massachusetts* 02139 (DF036270; AF-AFOSR-2493-73)

Microwave solid-state electronic devices are essential components of Air Force surveillance, electronic counter measures and communications systems. Current device performance deteriorates rapidly when components are subjected to high temperatures (greater than 200 degrees centigrade) due to either high power operation or high ambient temperatures. The use of wide band gap materials as the semiconductor in such devices offers one solution to the high temperature problem. Stannic oxide (SnO2) is one of the few wide band gap materials with a high enough electron mobility to be considered for device purposes. This research investigates the device physics of stannic oxide. High-mobility bulk crystals are being grown and examined for their electrical and optical properties. Epitaxial layers of SnO2 are being grown on various substrates in order to obtain layers suitable for device fabrication. It is expected that device operation at temperatures as great as 500 degrees Centigrade can be obtained. Spectroscopic studies will also be performed on midgap levels in Sno2O The understanding of these levels may be important for optimizing device performance and for using SnO2 as a visible display material.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0025, MATERIAL SUPPORT TECHNOLOGY - LASER-INDUCED FLUORESCENCE OF OH RADICALS
J.L. KINSEY, Mass. Inst. of Technology, School of Science, *Cambridge*, *Massachusetts* 02139 (DN475351; N00014-75-C-1105)

The energy deposition into internal electronic, vibrational and rotational states of molecules during reactive and nonreactive collisions is of importance in understanding the operation of lasers involving molecular species and the transport of energy in the atmosphere. These are of importance to the Navy through its interest in lasers and in energy dissipation and detection when the atmosphere is disturbed. The technique of Fourier transform Doppler spectroscopy being investigated may be useful in the study of turbulent flow and combustion which is of interest to the Navy area of jet propulsion.

The Doppler shift profile in three dimensions of fluorescence arising from laser excitation is being studied to determine the applicability of this method for determining cross sections differential in angle as well as energy. The OH radical formed in the collision of H and NoO is the prototype system being studied. The data for the reaction D plus NoO is being analyzed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0026, MODAL STRUCTURES
E.C. DUNTON, Barkley & Dexter Labs. Inc., *Fitchburg*, *Massachusetts* 01422 (DF901140; F19628-76-C-0164)

AF function - command/control communications. Deficiency -survivability of long-range emergency communications systems. Objective - to obtain transverse electric and transverse magnetic polarization data of man-made and natural sources. How research contributes -provides information concerning the use of transverse electric waves for improving air-to-air communication range.

Carry AFCRL Te/Tm dartsonde packages to high altitudes, then release and allow to free fall. During flights packages telemeter data to a ground receiving station.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0027, SUPERELLIPTICAL AERODYNAMIC FORMS
G.A. BARNARD, U.S. Army, Natick Research & Dev. Command, *Natick*, *Massachusetts* 01760 (DA0G4359)

To develop an easily-generated, cross-sectional shape for an aircraft fuselage or ship hull which will offer a useful compromise between external fluid-dynamic efficiency and efficient utilization of the internal space for cargo. Success in this endeavor will make available a substantial body of theoretical and empirical information originally gathered for approximate rectangles but which may be applied to superellipses, given an equivalence criterion.

Briefly, this has been approached by establishing a criterion of equivalence between a superellipse of a given degree and a conformal transformation, of a given order, for a rectangle. The next step will be to calculate the viscous boundary layer for representative superellipses, iterate this with the theoretical pressure distributions, and thereby predict the actual flow about certain representative configurations. As a final step, the validity of these predictions may be checked in a wind tunnel test.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0028, ELECTRICAL TRAPS IN MICROWAVE MATERIALS
M. ADLERSTEIN, Raytheon Company, *Waltham*, *Massachusetts* 02154 (DF040830; F44620-75-C-0063)

AF function - microwave electronic devices are essential components of Air Force communications, reconnaissance, surveillance, and countermeasures systems. Opportunity - improved performance of these systems can be expected from the use of better solid-state materials in devices such as the field effect transistor (FET). Present microwave solid-state device performance is limited by an excess number of electron traps existing in the epitaxial layers of these devices. Objective - the objective of this research is to define the nature of electron traps in epitaxial layers of gallium arsenide, a material which shows great promise for microwave FETs. How work contributes - this work will contribute to the improved performance of microwave devices by defining the sources of the traps, by understanding the effect they have on device performance, and by developing techniques for eliminating the traps.

The complex structure of the field effect transistor (FET) has made it difficult to identify the sources of the various traps in GaAs by using the FET as the basic test structure. Therefore, in the proposed work Schottky barrier and p-n junction diode structures will be fabricated on fet-like epitaxial layers in order to provide simpler test structures. The deep-level transient spectroscopy (DLTS) techniques developed earlier under this contract will be used to identify traps in these diode structures. The relative size of DLTS peaks will be observed as a function of various epitaxial growth parameters in order to identify the growth technique which produces the least amount of traps. For example, the relative partial pressures of arsenic and gallium will be varied by introducing differing amounts of arsenic trichloride and trimethyl gallium into the system. Correlation will also be made between trap measurements and the various techniques used to start growth, terminate growth, and change from one type of layer to another. Parameters such as growth rate and temperature will also be investigated. In addition, the occurrence of traps will be correlated with high-resistivity buffer layers grown by various methods. From all of the above work, a trap model will be developed, optimum epitaxial growth conditions will be defined, and FETs will be grown and compared against theoretical predictions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0029, APPLICATION OF SHAPE DISCRIMINATION/FEAT
M. SCHRODER, Control Data Corporation, *Minneapolis*, *Minnesota* 55420 (DF712110; F30602-76-C-0272)

The objective of this effort is to reduce the false alarms inherent in the change detection process that are caused by uncontrollable variations in aircraft positioning and by small irregularities in ground processing.

A technique will be utilized which uses information available in the current change detection algorithm. Pixels which are significantly different from their background and adjacent pixels will be examined and statistically evaluated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0030, THE CONSTRAINT METHOD FOR SOLID FINITE ELEMENTS

I.N. KATZ, Washington University, School of Arts & Sciences, *St. Louis, Missouri* 63130 (DF046190; AF-AFOSR-3122-77)

AF function - design of future aerospace vehicles. Opportunity -new techniques which allow control of the order of approximating polynomials and the number of elements in each division in 2-d finite-element stress analysis are presently available. Objective - this research will examine such techniques for the purpose of extending them to 3-d finite-element stress analysis. How work contributes - results may be useful in the design and analysis of 3-d structures in future aerospace vehicles.

This research will investigate the constraint method in finite-element stress analysis. In particular the following problems will be studied: (1) Development of hierarchical family of solid finite elements of arbitrary polynomial degree. Initially, in analogy with the 2-d case, a tetrahedronal family will be developed. (2) Investigation of the rate of convergence as a function of polynomial degree, for solid elements. It is conjectured that convergence rate will be higher than that obtained by decreasing element size. (3) Study of an error controlled rezoning scheme. (4) Development of curved elements both in two and three dimensions. (5) Computational experiments to verify results will be performed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0031, BOUNDARY LAYER SEPARATION FROM A SLENDER BODY AT HIGH ANGLES OF ATTACK

C.E. PRZIREMBEL, Rutgers The State University, School of Engineering, *New Brunswick, New Jersey* 08903 (DF048210; AF-AFOSR-3300-77)

AF function - advanced aerospace vehicles. Opportunity - improve analytical methods used to calculate aerodynamic forces and moments for slender bodies at high angle of attack. Objective - improve the current understanding of the complex three-dimensional separation/free-vortex shedding problem, which characterizes the flow field in the vicinity of a slender body at large angles of attack. How work contributes - will assist in a rational modification of existing analytical calculations of aerodynamic forces and moments for slender bodies at high angles of attack.

Existing experimental data, which include surface pressure distributions, and force and moment measurements for slender bodies in high Reynolds number flows, will be analyzed using existing turbulent boundary layer separation criteria. The calculated axial distribution of the two primary separation lines will then be investigated by comparison with the calculated axial distribution of the side force.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0032, FUNDAMENTAL RESEARCH IN TURBULENT MODELING

C. DONALDSON, Aeronautical Res. Associates, *Princeton, New Jersey* 08540 (DF042850; F44620-76-C-0048)

AF function - advanced aerospace vehicles. Deficiency - lack of understanding about turbulence and turbulent flows. Objective - modeling of turbulent flows with particular emphasis placed on terms dependent on pressure fluctuation. How contributes - an understanding of pressure fluctuations and their effect on turbulent flows is very important in understanding high-speed flows. It also implies an understanding of noise radiated by turbulent flows. Understanding of this phenomena will be directly applicable to the design of advanced aerospace vehicles.

A theoretical program reevaluating the modeling of turbulent flows will continue. Primary emphasis will be the development of rational scale equations and their application to correlation models containing the pressure fluctuations p'. Secondary emphasis will be on the modeling of triple scalar correlations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0033, INCOMPRESSIBLE AXISYMMETRIC WAKES

F.R. HAMA, Princeton University, School of Engin. & Appl. Sci., *Princeton, New Jersey* 08540 (ENG76-21913 A01)

This action will provide for an additional year of support for NSF Grant ENG 76-21913.

The research to be continued will be on the instability, vortex formation or shedding, and transition behind an axisymmetric body, particularly ellipsoid of revolution with a variety of eccentricity as well as a slender streamlined body. Detailed near wake surveys of velocity distribution behind an ellipsoid of revolution were completed near the end of the previous grant period. These data will be reduced and interpretation will be attempted. More specialized experiments will be designed to focus on the mechanics of nonlinear wake development and final breakdown. These latter experiments require new techniques and cannot be done by semiautomatic conventional surveys. The digital processing of data is essential.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0034, DEVELOPMENT OF LIGHTWEIGHT TRANSFORMERS FOR AIRBORNE HIGH POWER SUPPLIES

R. MCNALL, Thermal Technology Labs., *Buffalo, New York* (DF455460; F33615-75-C-2014)

This program has as its principal objective, the verification and demonstration of lightweight transformer technology as applied to the increasingly important field of inverter technology. This goal will be reached through the design of a small inverter transformer, its subsequent incorporation in a low-power inverter, making any changes necessary in the design optimization program to account for practical application of the design technique and finally designing and building two 200 kVA inverter transformers incorporating both SCR switches and a new high-power plasma switch being developed under a separate program.

The contractor will consider as part of his design task all hardware and software necessary for the design and fabrication of a 10 kVA and two 200 kVA transformers and their subsequent incorporation into operating inverters. The design of the transformers shall have as a goal a specific weight of 0.2 pounds per kVA or less and an efficiency in excess of 90 percent. The specific weight shall be computed on the basis of the total weight of core windings, coolant and enclosure.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

4.0035, THEORETICAL STUDIES OF WAVE PROPAGATION IN LAMINAR BOUNDARY LAYERS

G. MILLER, New York University, School of Arts & Sciences, *New York, New York* 10012 (DN675088; N00014-76-C-0183)

The instability of laminar boundary layers and the associated transition to turbulence are extremely complex phenomena that have major effects on the performance of aircraft and missiles throughout the speed range. An increased understanding of these occurrences, coupled with an improved predictive capability, could lead to a significant improvement in vehicle performance, particularly as regards range and fuel economy. The proposed research will study, theoretically, the propagation of waves through laminar boundary layers at high subsonic speeds emphasizing the nonlinear interaction of the wave with the boundary layer.

The stability of the laminar boundary layer will be studied, by finite-difference techniques, for the flow past a flat plate at high subsonic speeds. Disturbances will be introduced at the upstream, downstream and outer boundaries. The propagation and distortion of the disturbances, and the associated modifications of the flow, will be calculated using second-order compressible boundary layer theory. The influence of disturbance amplitude and wavelength will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0036, OPERATIONAL RELIABILITY EXPERIENCE TO IMPROVE RELIABILITY OF AF ELECTRONIC SYSTEMS

E. FLORENTINO, U.S. Air Force, Rome Air Development Ctr., *Rome, New York* 13440 (DF707570)

This in-house effort will be concerned with (a) the collection from all Air Force data sources of information on the reliability of Air Force electronic comunication, comand and control, surveillance, navigation, and display equipment; and (b) analysis of these data to determine the present field reliability of these items and comparison of predicted, measured, and observed field failures.

The field failure data collected will be analyzed to define the scope and impact on the reliability problem. Principal 'contributors' such as parts, equipment design, and human influences will be investigated. The influence of major offenders or 'weak links' in the system will be defined. Effects of equipment characteristics such as power output, complexity, and other factors on reliability will be determined. Reports on the above information will be published and disseminated to interested personnel.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0037, COMPARISON OF RAMAN SCATTERING METHODS FOR COMBUSTION DYNAMICS MEASUREMENTS

M. LAPP, General Electric Company, *Schenectady, New York* 12305 (DF048790; F49620-77-C-0094)

AF function - advanced diagnostic techniques, advanced air-breathing engines, weapon delivery and defense. Deficiency - inability to obtain reliable measurement of important parameters in turbulent reacting flows in practical hostile combustion environment via present-day measuring and diagnostic techniques, inability to reliably evaluate combustion models. Objective - to develop more sensitive selective, precise, reliable and rapid diagnostic methods for measuring important parameters in jet engine reacting flow environment. To determine feasibility of using virbational Raman scattering (VRS) for obtaining high spacial and time resolution temperature measurements in practical combustion environments, to determine capabilities and limitations of VRS as a laboratory diagnostic tool, to provide reliable experimental data to the combustion modeler. How work contributes - will provide additional understanding and reliable data to permit realistic evaluation of analytic models of complex reacting flow, will help reduce development time and cost of air-breathing propulsion systems, will permit evaluation of capabilities and limitations of various diagnostic methods, will aid in development of improved or novel new in situ nondisturbing techniques for accurately measuring turbulent reacting flow parameters.

Burners applicable and appropriate for comparative study of optical diagnostics will be investigated. Several types of portable and well-characterized laboratory combustion burner facilities designed to provide laminar premixed, turbulent diffusion, and spray combustion flames will be selected and constructed. These burners will be utilized in experiments to determine a basic flame gas property (specifically, instantaneous values of temperature) by VRS in these systems. Data obtained will be compared with similar work performed in another laboratory on essentially identical combustion apparatus, using the cars technique, (i.e., AFATL). Measurement difficulties will be purposely inserted into the probed flame systems in a controlled fashion in order to explore the significant differences between these measurement methods. The advantages and disadvantages of each technique for the various types of combustion systems encountered in air-breathing engines will be determined and their respective zones of applicability defined. (Text abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0038, ACOUSTIC WAVE EVALUATION OF SEMICONDUCTORS

P.K. DAS, Rensselaer Polytechnic Inst., School of Engineering, *Troy, New York* 12181 (DF049830; AF-AFOSR-3426-77)

AF function - solid-state microwave devices are essential components of Air Force command, control, communications and surveillance systems. Opportunity - methods for non-destructive testing microwave materials are presently inadequate. Objective - it is the objective of this research to develop and to perform non-destructive evaluation of III-V semiconductor materials using surface acoustic wave techniques. How work contributes - this research should provide a method to use routinely in testing non-destructively electronic materials after each step in device fabrication.

The interaction of acoustic surface waves in a piezoelectric substrate in the proximity of semiconductor charge carriers will be utilized to determine trap locations, surface and interface states, bulk and surface conductivity and mobility, and trap lifetimes by studying the attenuated output, and transverse acoustic-electric voltage in the presence of applied DC bias and different light wavelengths illuminating the semiconductor.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0039, ADVANCED CONCEPTS IN CLOSED-CYCLE ELECTRICAL DISCHARGE LASER TECHNOLOGY

R.A. OLSON, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (DF460890; F33615-76-C-2177)

AF function - electrical discharge gas lasers. Deficiency - presently there are no coherent long-life light sources to simultaneously cover all transmission windows from 1 to 5 microns. Research - an existing research system will be improved in aerodynamics, power conditioning and excitation, including photoionization to meet AF requirements. A significant decrease in size and weight will be achieved by development of a compact configuration. The closed-cycle laser technology developed will be applied to other electrical discharge lasers of AF interest. How research contributes - this research supports several AF requirements for multiple-wavelength medium-power high rep rate sources in the visible to infrared spectral range for electrooptical countermeasures.

The state-of-the-art of closed-cycle laser technology will be improved further by developing and incorporating new aerodynamic configuration concepts, by improvements in the laser geometry, by further development of the fast pulse-high repetition rate power conditioning system and by improving the laser parameter range (wavelength, power, rep-rate), for example, with improved photo-preionization. A new coaxial-flow system will be developed and tested. the closed cycle-high purity technology will be applied to other selected electrical discharge lasers of AF interest.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

4.0040, CORRELATION VELOCITY SENSOR SUPPORT

N. BANKE, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433 (DF106510)

An on-going Navy/AFAL program is concerned with demonstrating the feasibility of the correlation velocity sensor (CVS), a device which utilizes radar altimeter signals to measure the along-track and across-track velocity components of an airborne vehicle. Development and flight testing of cvs has been carried out by the Navy, with financial support provided by AFAL.

Feasibility demonstrations of CVS will be demonstrated in this joint Navy/AFAL effort, aboard a Navy helicopter.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0041, ESM PROCESSING TECHNIQUES EVALUATION

J. CASCHERA, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433 (DF097980)

The objective of this effort is to test and evaluate the performance of digital equipment used for passive ECM. This includes receiver to processor interfaces, data processing computers, both general and special purpose (preprocessors) and processor to user interfaces such as power management, displays, etc. This also includes interfacing passive ecm equipment with the digital avionics information system (DAIS). Current tasks under this work unit are (a) fabrication of the high-probability intercept receiver (HPIR) to microcomputer array processor (MAP) interface, (b) interfacing the adaptive electronic support measures (AESM) system with DAIS and (c) the design, fabrication and testing of a large-capacity ECM digital data recorder/reproducer.

Where possible digital processors will be interfaced with receivers and other components of the ECM system and tested with simulators such as the dynamic electromagnetic environment simulator (DEES). Where not possible, the input to the processor will be simulated by means of digital word generators simulating the output of the receiver operating in a static emitter environment. It is also possible to record the digital output of the receiver separately on magnetic tape or disc and playing the data back in real time to the processor at a more convenient time and place.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0042, RECONNAISSANCE AND WEAPON DELIVERY DIVISION SENSOR SYSTEM AND IMAGE ANALYSIS
E.L. GLIATTI, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433 (DF093550)

To process, maintain, and develop methods and applications of performing reconnaissance and/or weapon delivery related sensing system evaluations. Included in this are digital and analog computer analysis of flight environment and simulation, and microdensitometer and/or special equipment to perform imagery/display evaluations. These efforts are directed toward economically analyzing system and subsystem performance prior to flight and post-mission analysis and to various advanced imagery/display evaluation techniques such as edge analysis for determination of resolution capabilities.

This effort utilizes several advanced computer programs for processing vibration and rate gyro info into frequency spectrums, time amplitude, statistical analysis, and other analytic techniques useful in determining the environment of a reconnaissance or weapon delivery sensor and simulating this combined motion for flight performance prediction. Also, other special computer program process scanned imagery/display to develop the statistical results sufficient to evaluate imagery/display quality. This work unit additionally covers the maintenance and improvement of equipment and software.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0043, III-V COMPOUND SEMICONDUCTOR IMPURITY AND DEFECT INTERACTIONS AND ANALYSIS
Y.S. PARK, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433 (DF104070)

Air Force avionics systems require basic electronic components employing semiconductors such as GaAs and other III-V compounds. At present, characteristics of impurities and defects, and their interactions in III-V compounds are not well understood. The objective of this program is to research support to the AF effort to develop advanced, reliable, and radiation-hardened solid-state optoelectronic and microwave devices. The specific goals are to obtain info about the physical properties of impurities and defects through better characterization and control of the impurities and defects introduced into the materials. In addition, the research will provide info on new doping techniques needed for solid-state device fabrication from III-V compound semiconductors. This program is in support of AF effort to develop materials characterization techniques and apply toward the characterization and development of bulk and thin-film GaAs, InP and GaP materials for microwave, high-speed logic, and optoelectronic device applications.

Impurities and defects which alter electrical and optical characteristics of the materials are introduced into selected III-V and related compound semiconducting single crystals in a controlled manner by ion implantation and electron bombardment. Standard techniques such as measurements of electrical conductivity, Hall effect, photoconductivity, reflectivity, absorption, and luminescence are intensively employed to characterize the electrical and optical properties of ion-implanted and electron-irradiated crystals. Coupled with these measurements, the techniques of electron paramagnetic resonance (EPR), nuclear magnetic resonance (NMR), electron nuclear double resonance (ENDOR) are used to probe the type of radiation damage centers created by bombardments and other types of grown-in and diffused-in centers. Glow discharge optical spectroscopy (GDOS) and Auger electron spectroscopy are used to learn the depth profile and location of the implanted atoms.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0044, 150 KVA SAMARIUM COBALT VSCF STARTER/GENERATOR SYSTEM
C.T. TRIEBLE, General Electric Company, *Erie, Pennsylvania* 16511 (DF456870; F33615-74-C-2037)

The objective of this program is to demonstrate the feasibility and manufacturing techniques for the application of rare earth magnetics in a 150 kVA variable speed constant frequency (VSCF) starter-generator electrical system. The magnets shall be used as the sole source of excitation in a brushless generator that shall, in conjunction with a solid-state power cycloconverter, be capable of (1) generating 150 kVA, 400 Hz aircraft-quality power, and (2) function in a reverse power flow mode as a starter motor energized from a separate 400 Hz power source. The electrical system must meet the requirements of MIL-E-23001A relating to power quality except as modified herein.

This program will consist of three phases: (1) preliminary system design, samarium cobalt rotor construction and test, (2) fabrication of laboratory prototype starter-generator and converter/control unit, and (3) component and system evaluation tests. The implementation of phases 2 and 3 is dependent upon the successful completion of phase 1 and shall not be initiated prior to approval of phase 1 by the procuring contracting officer.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

4.0045, ADVANCED COMPOSITE HIGH-TEMPERATURE STRUCTURE
T.F. NEU, U.S. Navy, Air Vehicle Technology Dept., *Warminster, Pennsylvania* 18974 (DN481024)

Analytically synthesize and design an optimal advanced composite primary structural component suitable for the high-temperature environment of a high-performance vehicle. Assess design alternatives and exploit advantageous properties of boron-aluminum material to meet established design requirements. Provide a basis for in-house prototype fabrication, laboratory evaluation and flight demonstration.

Based on design requirements, potential weight and performance improvements, fabrication complexity and cost, and opportunity for flight demonstration, a primary structural component, the BQM-34E wing, was selected for an analytical design/synthesis effort. Computerized procedures will be used to generate an optimized design, upon which will be based an in-house fabrication and test effort.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0046, LV STORE INVESTIGATION
F.L. HELTSLEY, Arnold Research Org. Inc., *Tullahoma, Tennessee* 37389 (DF421023; F40600-75-C-0001)

Using a laser velocimeter, a wind tunnel test will be conducted to measure the flow field velocities surrounding a store model in a transonic flow field. Measurements will be completed first for the store model in an interference-free environment and then for the store model in the presence of flow interference from a wing or from additional stores.

The flow field velocities measurements will be used to validate a theoretical prediction scheme for predicting velocities in the region surrounding aircraft external store configurations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Arnold Engineering Development Center

4.0047, DEVELOPMENT TESTS OF CRL GAGES
W.B. STEPHENSON, Arnold Research Org. Inc., *Tullahoma, Tennessee* 37389 (DF420825; F40600-75-C-0001)

A test will be planned for calibration of a flight mass spectrometer payload supplied by AFGL and the flow about the instrument sampling orifice will be analyzed.

This effort requires a supporting test effort in the 10V test chamber using a Mach 3 low-density nozzle to supply supersonic flow of N2 and N2-O2 mixtures over a range of stagnation pressures and temperatures. The data will then be analyzed and reported.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Arnold Engineering Development Center

4.0048, MIXED FINITE-ELEMENT APPROXIMATIONS IN STRUCTURAL MECHANICS
J.T. ODEN, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (DF038420; AF-AFOSR-2660-74)

AF function - advanced aerospace vehicles must have structural systems with improved reliability and durability. Deficiency - analysis methodologies do not exist which can satisfactorily solve problems of fracture and crack growth. Objective - the objective of this research is to improve the analysis accuracy and efficiency for the study of cracks and internal defects in structures. How work contributes - this research contributes to the Air Force research program investigating improved fracture and fatigue predictions.

Hybrid and mixed finite-element analysis will be used during the course of this research. The theory of this approach will be studied in an effort to develop criteria for the selection of trial functions representing singular behavior. In addition, error estimates and solution stability will be investigated. These studies will result in an evaluation of the effectiveness and accuracy of hybrid 'crack elements' in the prediction of fracture phenomena. Research will also investigate methods of rezoning element models and estimating solution accuracies.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0049, AEROELASTIC CHARACTERISTICS OF A CASCADE OF BLADES
B.M. RAO, Texas A & M University System, School of Engineering, *College Station, Texas* 77843 (DF039300; AF-AFOSR-2700-74)

AF function - advanced turbomachinery. Opportunity - develop improved prediction techniques for unsteady flows in turbomachinery. Objective - develop a technique useful for solving the problem of unsteady flow effects on a cascade of rotor blades in subsonic non-uniform or oscillatory inlet flow conditions. How work contributes -unsteady airloads and flutter characteristics of compressors are not adequately predictable today. This method will eventually provide a method useable in the design of advanced compressors.

A Fortran computer program has been developed for determining the unsteady airloads in subsonic compressible flow on a cascade of blades with arbitrary inter-blade spacing, stagger, and phase angle. It is now intended to combine this program with a flutter analysis program resulting in a general, classical, two-dimensional, bending-torsion flutter program for a cascade of blades including camber effects.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0050, ROBUST PARAMETER ESTIMATORS FOR COMMUNICATION DATA
P. PAPANTONIKAZAKO, Rice University, School of Engineering, *Houston, Texas* 77001 (DF046340; AF-AFOSR-3156-77)

AF function - radio multi-access communications, remote sensing, image encoding schemes and radar signature recognition. Deficiency -improvements are needed in the techniques of signal estimation and image processing in the presence of unpredicted interferences and abrupt changes. Objective - develop estimators that are 'robust' in the presence of statistically 'contaminated' communication data. How work contributes - this research will allow for better design of communication systems and signal processing techniques.

A big percentage of the communication channels in the literature has been modeled as Gaussian and additive; in the term 'channel' one incorporates all disturbances and measurement errors that are undesirable and which one must get rid of. The main reason for the Gaussian and additive assumptions in modeling is analytical simplicity. However, communication channels are often subject to abrupt changes. Therefore, realistically speaking, even when the channel can be modeled successfully as additive, one almost never has a very accurate knowledge of the true underlying distribution. Taking this under consideration together with the fact that the performance of some of the classical parametric tests or estimates for some information retrieval is very unstable under small changes of the underlying distribution, the need for study and design of receivers (or estimators) insensitive to such changes becomes evident. This need has been recognized by statisticians and engineers, and that is how the nonparametric and robust concepts were created. However, although test with small sensitivity to distribution changes have been proposed and analyzed, the area is far from being exhausted. Indeed, the nonparametric property has been treated separately from the concept of robustness, although they should be connected. The subject of this proposal is the design of estimators that are 'robust' in the presence of statistically 'contaminated' communication data. A radical approach to the concept of robustness is used. A precise detailed definition of statistical contamination is given. Such definition is very sensitive to the distance between probability measures that are used. Robustness is defined as a stability property inside certain contaminated families. Constructive analysis of robustness as defined above leads to methods for designing 'robust' estimators where the concept is not vague any more.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0051, RESEARCH ON HYDRAZINE STARTER
W. JORGENSON, Rocket Research Corporation, *Redmond, Washington* 98052 (DF457520; F33615-75-C-2027)

The objective of this program is to demonstrate the feasibility of modifying an existing cartridge starter to operate with a hydrazine monopropellant. Overall goals of this modification are to achieve a factor of four improvements in life, improved safety, a significant reduction in smoke and pollution, and reduced time between restart attempts. This program is an Air Force effort to significantly reduce the life-cycle cost of cartridge starters. Based on the success of this program, any future effort would define in detail, a flight weight and configured design, make detailed studies of safety and logistics, and would demonstrate life and optimized performance.

To minimize the cost of this program only concept feasibility shall be demonstrated. An existing line item cartridge starter shall be modified to operate with hydrazine. The rotating equipment in existing cartridge starters is projected to be capable of at least 2000 start cycles if hydrazine decomposition products are used as the working fluid. Therefore, the proven rotating equipment from existing cartridge starters will be retained and a hydrazine propellant system adapted to them. This program will consist of the following two phases: (1) design - to complete a breadboard system design for test purposes and a conceptual flight configured system design for planning purposes, and (2) fabrication and design - to demonstrate feasibility of the concept by breadboard system testing. At the conclusion of the design phase, a program review will be given. At the conclusion of the test phase, a program review covering the entire program shall be given.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aeropropulsion Lab.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, ATMOSPHERIC INFRASONIC WAVES
C.R. WILSON, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (ATM77-03690)

This grant supports the operation of the infrasonic microphone array at Fairbanks, Alaska, for the study of at-

mospheric infrasonic waves in the period range from 10 to 100 seconds. The infrasonic equipment will be run continuously throughout the year to provide observational data for the study of auroral infrasonic waves (AIW), aerodynamic infrasound from mountain and jet stream induced atmospheric turbulence, microbarom activity from air-sea surface interactions, volcanic eruptions, and surface seismic waves.

The existing data bank of incoherent scatter E region electron density and electric field measurements from the Alaskan Chatanika radar station as well as future radar data to be taken by other experimenters will be used to continue the study of supersonic auroral electrojet arcs that produce AIW.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0002, NAVY ENVIRONMENT - INFRARED ATMOSPHERIC PROFILING

J.Y. WANG, General Dynamics Corporation, *San Diego, California* 92138 (DN575314; N00014-75-C-0940)

Operation of Navy aircraft near the sea surface and naval combatants on the sea surface require accurate and timely environmental information which will allow the operational commander to fully assess his options. The paucity of available environmental information over the oceans compounds the Navy's problem of accurately forecasting atmospheric conditions. An infrared profiler will provide a reliable, easily maintained, automatic, remote sensor for the measurement of water vapor and temperature in the vertical from the surface up to 7 km.

The remote infrared atmospheric profiling system (RIAPS) is presently operating at the contractor's facility. This work consists of an examination of the software associated with the RIAPS computer, looking to the possibility of incorporating statistical models based on available meteorological data of a particular location. This will reduce computer running time and improve the accuracy of the retrieved temperature and humidity profiles.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0003, OPERATE GOOSE BAY IONOSPHERIC OBSERVATORY

J. KELSEY, Canadian Commercial Corp., *Ottawa, Ontario, Canada* (DF241140; F19628-76-C-0072)

AF function - communications, surveillance and navigation at high latitudes. Deficiency - the disturbances of the high-latitude or arctic ionosphere frequently cripple the above functions. Existing understanding is insufficient to predict disturbances and their impact. Ionospheric/auroral models which will allow routine operation of AF systems in this environment are still marginal. How research contributes - the geophysical data base provided by the contractor and enhanced data output obtained during coordinated aircraft/ground-based experiments are the basis for research advances in the areas of scintillation studies, monitoring of the state of the high-latitude ionosphere and modelling of the bottomside ionosphere. These efforts support satellite communications and all AWS users dealing with the high-latitude ionosphere and are important to the development of techniques to support CONUS OTH-B.

Contractor operation of ionospheric vertical and backscatter sounders, polarimeters, riometers and magnetometers provides the data for real-time support of AWS/GWC during night hours. These data, enhanced by data from an all-sky camera and from satellite receivers for scintillation measurements, are sent to AFGL for scientific analysis. A system for the automatic pre-analysis of geophysical data will be evaluated and improved with the goal of total automation of real-time data analysis. Operation of the station is enhanced during selected periods of airborne ionospheric studies of the arctic ionosphere and auroral effects on AF systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0004, EXPERIMENTAL OPTICAL SENSING

G. OCHS, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (8AA71310)

PROJECT OBJECTIVE: Experimental studies of the use of visible and infrared light beams for remotely sensing atmospheric parameters, particularly wind and turbulence.

CURRENT YEAR PLAN: Continue development of optical and infrared wind-sensing systems, and investigate the possibility of making infrared measurements of humidity flux.

PROGRESS REPORT: Designed and built improved versions of various optical wind and Cn2 sensors. New short-path, incoherent, optical Cn2 sensor is expected to become state-of-the-art standard and to replace high-speed temperature probes for most purposes.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0005, ACQUIRING TEST AREA IMAGERY

UNKNOWN, H A R P Ltd., *Denver, Colorado* (WELUT NO. 0003.2-76)

This project is designed to acquire imagery at medium scale for the Regional Environmental Test Areas by duplicating the existing best one-time Test Area Imagery held by various other agency offices, obtain new aerial photography where coverage for each Test Area does not exist, and purchase digital magnetic tapes of specified LANDSAT Imagery for each Test Area. The acquisition of imagery is a joint effort among the FWS, BLM, and EPA.

ADDENDA: Project officer: Denny Parker.

SUPPORTED BY U.S. Dept. of the Interior, Fish & Wildlife Service, Office of Biological Services

5.0006, INVESTIGATE POTENTIAL OF INTERPLANETARY SCINTILLATION AS PREDICTOR OF SOLAR INITIATED GEOPHYSICAL DISTURBANCE

E. ROELOF, U.S. Navy, Sea Systems Command, *Washington, District of Columbia* 20001 (DF247900)

AF function - communications and surveillance. Deficiency - inability to predict the arrival time or magnitude of solar geophysical disturbances. Objective - investigate potential of interplanetary scintillation measurements as useful predictors of solar turbulent plasma propagating toward the earth that will cause significant geophysical disturbances. How research contributes - determine feasibility of using interplanetary scintillation data as a predictor of geophysical disturbances that affect the environment in which USAF systems operate.

Acquire interplanetary scintillation data from about 180 sources using the University of Iowa COCOA-cross 70,000 square meter array. Analyze this data and correlate it with solar terrestrial phenomena to determine if interplanetary scintillation data can be used as a predictor.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0007, LAND RECLAMATION PROGRAM

R.P. CARTER, Argonne National Laboratory, *Argonne, Illinois* 60439

OBJECTIVES: The Land Reclamation Laboratory has been formed to address the need for coordinated basic and applied research into the geophysical, geochemical, biological, ecological, aquatic, and soil phenomena of mined land reclamation, especially relative to cost-effective techniques for rehabilitation coal mined land. Near and long-term efforts are focused in the major U.S. coal resource regions where results will be evaluated, disseminated, and coordinated with related studies of industry, academia, and government agencies.

APPROACH: The Program is being conducted by interdisciplinary teams of scientists and engineers to develop, test, evaluate, and assess field and laboratory surveillance methods and monitoring systems for pre-, operational, and post-operational reclamation activities associated with coal mining operations. The Program includes tasks of data acquisition systems, geoscientific and ecological analysis methodology, techniques for integrated and automated mine site monitoring systems, and ecosystem model development.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Biomedical & Environmental Research

5.0008, EXPLORATORY DEVELOPMENT PROGRAM TO DEVELOP BROADBAND MICROWAVE ABSORBER MATERIALS

I. KOFSKY, Univ. Inst. for Navy, *Naples, Italy* 80100 (DF243300; F19628-75-C-0126)

AF function - low-altitude operational satellites and ballistic nuclear weapon delivery. Deficiency - trajectory of missiles and satellites cannot be precisely calculated. Research - utilization of measured turbulent transport parameters in model atmospheres. How research contributes - permits more accurate calculations of dynamic model atmospheres. The results can be used to predict missile reentry and satellite orbit calculations. Abstract - the objective of this work is to measure the turbulent diffusion coefficients and heating rates of the upper atmosphere and incorporate them into model atmospheric calculations.

The molecular and turbulent diffusion coefficients and turbulent heating rates will be determined from the measurement of the fluctuations of tracer density observed in rocketborne chemical trails in the stratosphere, mesosphere and lower thermosphere. These measured vertical coefficients will then be incorporated into one-dimensional atmospheric models and the resultant species distributions compared to existing measurements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0009, TWENTY KILOMETER TETHERED BALLOON CAPABILITY

J.F. DWYER, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF243950)

AF function - advanced high-altitude tethered balloon system for surveillance, monitoring, environmental research, space vehicle test. Deficiency - current tethered balloon technology and equipment limits the use of this type of vehicle to altitudes of less than 10 km. Objective - develop a tethered balloon system capable of flying at an altitude of 20 km. How research contributes - development and flight of a balloon at 20 km will prove the feasibility of operating tethered balloons under these conditions on an operational basis.

The design of a 20 km system, including balloon, cable, winch and other equipment, will be undertaken. Computer simulations of various combinations will be undertaken in order to examine all parameters associated with the problems of attaining higher altitudes. A study of meteorological profiles in the area of the test site is required -winds, for example, have a significant effect on the sizing of equipment. High surface temperatures will exist in the most opportune months, windwise, necessitating provisions for extra cooling of the winch during long periods of reeling. A low-altitude flight test will be made to check the adequacy of winch cooling and to evaluate a prototype of the best candidate Kevlar cable. Suitable balloon and cable specifications will be established to enable their purchase in the following year.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0010, ONE-DIMENSIONAL ATMOSPHERIC SIMULATION

T.J. KENESHEA, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF244580)

AF function - communications and satellite surveillance. Deficiency - inadequate knowledge of the atmosphere, particularly for determining the effects of natural or man-made disturbances. Objective -to measure turbulent and laminar transport coefficients in the upper atmosphere and develop improved theoretical model atmospheres of neutral and ionic composition. How research contributes - following solar proton events and nuclear detonations, radio communications are interrupted and missiles and satellites are lost from radar view. Improved models which can predict ionospheric perturbation effects can aid in the communications with and tracking of airborne vehicles and missiles during these events.

Computer codes have been expanded to include nitrogen and ionic species as well as dynamic mechanisms and will be used to generate theoretical atmospheric models. These models will be extended to include heat, momentum and energy transfer as well as solar and dynamic heat sources. Meridional circulation will also be incorporated into these models, based upon the latitudinal differential spatial heating due to the solar and dynamic mechanisms operative in the atmosphere.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0011, RADIANCE INVERSION TECHNIQUES FOR ATMOSPHERIC INFERENCING

J.F. KING, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF246150)

AF function - optical environmental sensing. Deficiency - inability to extract atmospheric structure needed for flight operations from DMSP satellite observations. Objective - develop an optimal inversion technique for inferring vertical atmospheric temperature from remotely sensed DMSP infrared radiance data. How research contributes -information inherent in DMSP vertical profiler is currently unexploited because of unsatisfactory data - processing (inversion) techniques. Optimal inversion method would extract all possible atmospheric structural information for flight operations and surveillance systems.

A new nonlinear inversion method has been developed which employs repeated convolution rather than direct inversion to fit the satellite observations. Technique is compatible for use with empirical atmosphere transmittance data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0012, TECHNIQUE DEVELOPMENT FOR SOON DATA UTILIZATION AND PREDICTIONS OF SOLAR-INDUCED ENVIRONMENTAL DISTURBANCES

D.F. NEIDIG, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249460)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate warnings of sun-induced disruptions of AF communications and detection systems. Objective - assist the Air Weather Service in improving the monitoring and prediction of disturbances and study coronal holes and their relations to the geomagnetic index. How research contributes - this work unit is concerned with the instrumentation and techniques necessary for the detection and prediction of solar flares.

Members of the AFGL contingent at SPO will work closely with the Air Weather Service and ESD to give technical assistance during contract production of the SOON system by the National Science Foundation at SPO and by NAFI. When the first production telescope is installed at Holloman AFB, the branch will begin standardization and debug tests on the videometer instruments at Holloman and Palehua. To improve the reliability of a-sub-p predictions, two efforts will be undertaken. First, present analysis programs using FE 5303 (greenline) observations from the 40-cm coronagraph will be refined and modified to convert this project from a complex research task to an automatic data reduction routine. Second, branch personnel will give technical assistance to NSF personnel at SPO on construction of the one-shot coronagraph, which will provide additional data for the a-sub-p analyses when completed. It will then be used by branch personnel in full-limb observations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0013, ADVANCED WEATHER RADAR DATA TECHNIQUES

P.J. PETROCCHI, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF254490)

AF function - observing and forecasting the environment in direct support of strategic and tactical operations. Deficiency - operational effectiveness of weather instrumentation is not sufficient to meet operational support requirements. Objective - to develop and evaluate new weather radar data processing

techniques for operational use. How development contributes - provides a more reliable means for the identification and forecasting of hazardous weather.

The unique capability of the weather radar processor and color display which can play-back up to 40 complete PPI presentations will be fully exploited in the development of operational techniques with conventional weather radars and Doppler radars. The basic system capability will also be expanded to provide real-time measurements of constant altitude and vertically integrated reflectivities as well as vertically integrated liquid water content.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0014, COLLISIONAL EXCITATION OF 4.3 MICROMETER BAND OF CO2

A. RAHBEE, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249150)

AF function - missile launch detection, target discrimination, surveillance, trajectory prediction. Deficiency - the magnitude of infrared signals in SWIR, MWIR and LWIR, due to high-velocity collisions of plume and atmospheric species is unexplored, thus target definition is unknown. Objective - to measure cross sections for high-velocity reactions in plumes leading to potential infrared emitters. How research contributes - will aid target discrimination at high altitudes by providing parameters for the reactions occurring in plume/atmosphere interactions.

The technique of high-velocity molecular beams will permit laboratory measurements in the ballistic velocity range which cannot be done in any other way.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0015, SATELLITE STUDIES OF LOW-ENERGY IONS AND ELECTRONS

R.C. SAGALYN, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF248930)

AF function - surveillance, communication, navigation, ionosphere and magnetosphere modeling. Deficiency - because little is known of electron density distributions in the topside ionosphere, large uncertainties exist in tec determinations required for prediction programs. Ionosphere small-scale irregularities cause amplitude and phase changes of HF and UHF transmissions. Objective - the development, test and calibration of the SSIE instruments to be flown on the DMSP block 5d satellites will be completed. Studies of low and mid-latitude small-scale irregularities will be intensified. How research contributes - the results of the DMSP SSIE sensor will be used to update AWS ionosphere prediction programs. Knowledge of the power spectra and morphology of ionosphere small-scale irregularities will aid in the design and operation of UHF communication and navigation systems.

Plasma instruments are designed for satellite flight. Results from ISIS-I, INJUN V and S3-2 satellites will be analyzed to study ionospheric irregularities.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0016, INFRARED HORIZON OF THE EARTH

B.D. SCHURIN, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249290)

AF function - surveillance, reconnaissance, detection, guidance and navigation. Deficiency - uncertainties in infrared horizon profile now severely limit accuracy of horizon sensors, and interfere with target acquisition by near-horizon surveillance systems. Research - carry out rocket measurements of the infrared radiance of the earth's horizon. Develop infrared horizon profile models for the earth's atmosphere. How research contributes - permits development of more accurate horizon sensors and more effective target detection systems. The results of this effort provide the basic infrared radiance characteristics for the earth's upper atmosphere which are currently not available. It provides the radiance background against which AF systems will have to operate as well as the transmission characteristics of the atmosphere through which they will have to carry out their missions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0017, DESIGN AND SPECIFY HIGH-ENERGY ELECTRON INSTRUMENT

K.G. YATES, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF580060)

AF function - navigation, communication and surveillance. Deficiency - inaccurate environmental specification for radiation hardness of microelectronic components will result in inefficient criteria for military satellite systems. Objective - design and specify high-energy electron instruments for satellite measurements. How research contributes - direct measurement of the high-energy electron spectrum will resolve uncertainties in calculations of radiation hardening requirements.

Instruments for measuring electrons of energies from .1 - 1 meV are well within the current state of the art. After review of the current designs, appropriate instruments will be specified and fabrication initiated. For electrons of energies of 1 - 10 meV, however, newer concepts and technology must be tested before definitive specifications can be prepared. After that point this higher energy instrument will be specified and fabrication initiated. This replaces IHWU 76010902 (High-Energy Electron Program) which is to be terminated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0018, INSTRUMENTATION FOR ACCELEROMETER DENSITY MEASUREMENTS

J. OTIS, Wentworth Institute, Undergraduate School, *Boston, Massachusetts* 02115 (DF278900; F19628-75-C-0051)

AF function - airborne surveillance and weapons delivery. Deficiency - accurate predictions cannot be made for ephemerides for low-altitude operational satellites and missile targeting because of lack of adequate density data. Research - improved accelerometers and rocket instrumentation for accurate density measurements in the 35-140 km altitude range. How research contributes - density data in this altitude range can significantly improve the accuracy of satellite ephemeris and missile targeting calculations. Objective - the object of the proposed work is to up-grade the accuracy of rocketborne techniques and instrumentation used to determine mean model values and extremes of departure about mean values under varying atmospheric conditions. A major portion of the effort under this procurement will be directed toward optimizing sensors and sub-system performance for improved density measurements over the required range. Data from rocket launches will be utilized for progressive evaluation of contract objectives and accomplishments.

Work on this contract will provide a major transition in fabrication and payload integration of new rocket hardware for 10-inch falling spheres in addition to follow-on effort on accelerometers and specialized electronic sub-systems for the standard 7-inch sphere and the hi-ball densitometer. Instrumented rocketborne payloads will be used to determine neutral upper atmospheric density and temperature in accordance with Air Force requirements. Work will include: (a) applied engineering research and development with regard to related rocketborne sub-systems, (b) fabrication, laboratory tests and calibration, (c) environmental testing to insure payload integrity, and (d) field support of rocketborne payloads launched at designated sites.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0019, MAGNETIC INDICATORS OF SUBSTORM ACTIVITY

R.L. CAROVILANO, Boston College, School of Arts & Sciences, *Chestnut Hill, Massachusetts* 02167 (DF248270; F19628-77-C-0085)

AF function - operation of communication, detection, and navigation systems and satellite orbit prediction. Deficiency -

severe geomagnetic disturbances produce extreme departures from the normal conditions in the ionosphere that degrade system performance and increase atmospheric drag on satellites. Objective - develop a method for identifying the onset and specifying the development of magnetospheric substorms utilizing measurements made by the Air Force Geophysics Laboratory ground-based magnetometer network. How research contributes - a method for real-time specification of the development of magnetospheric substorms is essential for geomagnetic activity forecasts. The forecasts will enable system operators to take appropriate measures to lessen the impact of magnetic disturbances on operational capability.

Specifying substorm activity with data from the Air Force Geophysics Laboratory magnetometer network involves efforts in three areas - development and evaluation of a suitable index, investigation of micropulsation activity as related to substorms, and extension of ionospheric current models to characterize the intensity and location of current systems producing mid-latitude magnetic variations. An index specifying substorm activity will be developed utilizing measurements made by the magnetometer network as the main data input. The quality of the index will be evaluated by comparing it with additional magnetic and auroral particle data from a number of observed substorms occurring at various universal times. Geomagnetic micropulsation activity in the period range 10-150 seconds will be investigated for possible correlations with interplanetary magnetic field conditions that generally result in substorm activity. Analytical models of global ionospheric currents will be improved by including experimentally determined ionospheric conductivities and extended to calculate the magnetic perturbations produced at the surface of the earth.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0020, STRUCTURE OF THE UPPER ATMOSPHERE
J.M. FORBES, Boston College, Graduate School, *Chestnut Hill, Massachusetts* 02167 (DF047160; AF-AFOSR-3223-77)

AF function - variations in neutral atmospheric structure are of importance to satellite and missile design and generation, and have important effects on communications systems. For instance, satellite ephemeris prediction, missile trajectory prediction, missile plume simulations and computer simulation of nuclear blast effects are operational problems which are affected by neutral atmosphere structure. Deficiency - in spite of progress made in the area of atmospheric physics, a sufficiently accurate model of the neutral atmosphere does not exist. Theoretical research in the area of thermospheric structure is needed to explain variations in density and composition data from recent satellite experiments which disagree in some respects with incoherent scatter data. Objective - the purpose of the proposed research is to perform theoretical numerical solutions of the quiet and magnetically-disturbed upper atmosphere, and to determine the consistency of the results to available and incoherent scatter data. Contribution - an improved model of the neutral upper atmosphere will provide a better theoretical base for predicting missile trajectories and satellite drag and will contribute to improved models of changing ionosphere and communication effects.

This work will involve using previously developed computer programs for solving the complete, coupled, inseparable momentum, continuity, and thermodynamic equations for the quite-time thermosphere, and an f-plane approximation to the full three-dimensional model. These programs will be used to study seasonal variations in thermospheric tides, mode-coupling effects on thermospheric tides, the super-rotation mechanism, and possibly composition variations. Proposed study of the magnetically-disturbed atmosphere primarily involves development of a time-height-latitude-longitude model of the response to a localized, transient, heat source. Ion drafy acceleration will also be included as a momentum source during magnetic disturbances.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

5.0021, MODIFY DIGISONDE EQUIPMENT
K. BIBLE, Univ. of Lowell, Res. Foundatton, *Lowell, Massachusetts* 01854 (DF248470; F19628-77-C-0024)

AF function - communications and detection. Deficiency - prediction and real time specification of the arctic ionosphere. Objective -modify existing digital sounding systems at AFGL Goose Bay Ionospheric Observatory allowing for spectral integration to improve signal-to-noise ratio in disturbed auroral environment. Approach will provide Doppler information for all ionospheric and auroral returns observed. Updating of data reduction programs to improve data presentation of data used in ionospheric modeling and remote monitoring studies. Reduction of digital ground-based and airborne ionograms. How research contributes - provides further progress in digital sounding techniques through the modification of ionospheric sounding equipment at the AFGL Goose Bay Ionospheric Observatory and the NKC-135 research aircraft. The contractual efforts also provide maintenance support and consultation on complex digital systems. The Goose Bay ionospheric data are essential in the Laboratory's research efforts in providing HF systems a model of the arctic ionosphere.

Modify the Goose Bay Observatory digisonde to provide Doppler line information. Develop improved software techniques to analyze, process and display the modified digital ionogram data. Develop methods for noise reduction and data compression for digital ionograms. Incorporate improvements in Goose Bay Observatory and Airborne Observatory. Provide consultation on modifications of aircraft and Goose Bay Observatory digital ionosondes, to meet changing project experimental needs. Reduce and analyze digital ionogram data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0022, AUTOMATED WOOD DRYING BY REMOTE SENSING OF MOISTURE AND SHRINKAGE GRADIENTS
J.L. HILL, Univ. of New Hampshire, Inst. of Nat. & Environ. Rsou., *Durham, New Hampshire* 03824 (0010776; NH00003-M)

OBJECTIVE: Derive and empirically verify an analytical model of wood drying as the basis for a computerized automatic control system for kiln drying of hardwood lumber. Develop a working prototype of an automatic dry kiln control system based on a predicting model. Determine the economic feasibility of an automated kiln drying system.

APPROACH: Develop a workable mathematical predicting model of wood drying. Verify the predicting capability of the model. Write a computer program for the model to be used in actual control trials. Computer control input will be data coming from moisture gradient sensors and strategically located strain sensors in kiln sample boards. Output will be humidity, temperature and circulation control settings for the dry kiln. Using existing cost-study computer programs determine the production costs of the automated kiln drying system.

PROGRESS: The software package for the automated kiln-drying process control system is nearing completion. The drying (moisture diffusion) model has been simplified to use less computer time by increasing computational efficiency. An added bonus of this simplification permits more efficient determination of model regression coefficients. A second drying test on a charge of 8-1/4 x 8 red oak has been completed. This test has demonstrated more effectively than the first test the workability of the moisture diffusion model and data from this test has been used to quantify the effect of ring angle on drying time. Preliminary data indicates that drying time is related to ring angle and this will be used to improve the predicting capability of the complete drying model. A model to predict heat losses from the kiln has been developed to refine the energy element of the cost function of the control algorithm. The formula for the kiln-floor heat loss factor has been modified as a result of both theoretical and experimental investigation. In general the heat loss through the kiln floor is significantly less than indicated in previous work. The final form of the cost function for the control algorithm has six (coefficients) elements: time, energy, moisture content, stress, strain (set), and failures (checking, etc.). Two of these, time and moisture content, have been quantified.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, New Hampshire

5.0023, FIELD ANALYSIS OF LANDSAT COMPUTER MAPPING
R.E. STOIBER, Dartmouth College, School of Arts & Sciences, *Hanover, New Hampshire* 03755 (EAR77-17927)

This project involves the field checking of results of geologic mapping using digital data from satellites (LANDSAT). A statistical approach allows the identification of certain rock types by using poorly defined ground truth from large-scale geologic maps. The method is particularly useful in areas with little vegetative cover. Spectral signatures of mafic and ultramafic rock types identified by comparison with mapped areas in the Oman ophiolitic complex have been extrapolated to mapping in less known areas in Afghanistan and Iran. Present mapping suggests that it is possible to delineate leached outcrops (gossans) associated with massive pyritic copper sulfide deposits in the pillow lavas of Oman. Field checking will obtain detailed information for verification of interpretations based on spectral images. The objective is to refine this method of geologic mapping by remote sensing methods. The approach is important for regional studies in remote areas and for identifying targets for exploration for certain types of ore deposits.

SUPPORTED BY U.S. National Science Foundation, Div. of Earth Sciences

5.0024, AMS INFORMATION FOR ARMY HELICOPTER AND AIRBORNE ASSAULT OPERATIONS
E.A. BLOMERTH, U.S. Army, Atmospheric Sciences Lab., *Las Cruces, New Mexico* 88002 (DA0F1744)

Develop a software system for the preparation of information to furnish user (G2, G3, aviation officer, artillery officer, SWO, etc.) with estimates of limited area, short-term predictions of cloud and visibility conditions as related to terminal, inflight and target area locations.

Develop, using existing technology, mathematical descriptions of cloud and moisture distributions and the related parameter, visibility. Determine meteorological inputs to drive the mathematical models and establish, through coordination with the user organizations, the methods of product presentation and dissemination.

SUPPORTED BY U.S. Dept. of Defense, Electronics Command, Atmospheric Sciences Lab.

5.0025, SATELLITE ACCELEROMETER FIELD SUPPORT
W. LANGE, Textron Incorporated, *Buffalo, New York* 14205 (DF249770; F19628-77-C-0121)

AF function - airborne surveillance, target acquisition. Deficiency - atmospheric density variations with time and space cannot be accurately predicted. Objective - provide field services associated with the launch of atmospheric density triaxial accelerometer systems. How research contributes - permits development of accurate density forecasting techniques.

The new Seta triaxial accelerometer will be flown on three Air Force satellites during 1977-1978. The new Roca accelerometer will be flown on an Air Force satellite during 1978. Pre-launch integration and testing will be supported to verify that installation and checkout procedures are as required and that instrument operation is normal. The second and third NAVPAC units will require additional vibration testing and subsequent recalibration. These procedures will ensure that all instruments are properly integrated and operating prior to launch.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0026, AIRCRAFT RADIATION MEASUREMENTS OVER ST. LOUIS
T.N. CARLSON, Penn. State University, School of Earth & Min. Sci., *University Park, Pennsylvania* 16802 (R805500-01; G603A-AA-36)

Aircraft radiation measurements made on board the Penn State Aerocommander during the 1976 and 1974 St. Louis RAPS project will be processed and the data reduced for the purposes of assessing the effects of aerosols in the urban boundary layer on transmission and for testing of radiative transfer models.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0027, SOLAR RADIO PATROL (MANILA)
V.L. BADILLO, Manila Observatory, *Manila, Republic of The Philippines* (DF260080; F19628-76-C-0026)

AF function - to predict interruptions in communications and false alarms from natural causes. Deficiency - signatures of causative proton events from monitoring and interpretation of solar bursts. Objective -to develop solar signatures as warning devices of proton events. How research contributes - makes reliable real-time information available to operational AF groups. The primary purpose of this contract is to use Manila Observatory collected data in solar-radio-optical ionospheric and geomagnetic areas to interpret large complex radio bursts in relation to energetic particle emission.

Improve upon earlier AFCRL established criteria of quantitative relationships between radio and particle flux densities. A useful data input will be more burst spectral data from high-frequency monitors. To this end present patrols will be augmented by a 15 gHz patrol. Criteria for non-typical proton events will be sought in burst and burst region parameters. The contract will continue to develop a better understanding of the relation between solar emission and ionospheric variations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0028, STUDY FREE BALLOON DESIGN
A.E. CRONK, Texas A & M University System, School of Engineering, *College Station, Texas* 77843 (DF246350; F19628-76-C-0082)

AF function - advanced balloon systems (surveillance, delivery operations, environmental research support, space equipment test). Deficiency - balloon design criteria are inadequate to take maximum advantage of improved material properties. Objective - develop criteria for advanced balloon designs using improved materials. How research contributes - the gross lift capability of balloons will be increased enabling improved capability (duration, altitude, payload and maneuverability) with enhanced reliability.

A load transfer model will be developed to accurately describe stress distributions under various flight conditions. This model will be integrated with temperature and strain rate dependent biaxial yield stress design criteria into a computerized design procedure. The effects of using flat gores to develop three-dimensional surfaces will be examined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0029, NAVY ENVIRONMENT - FOG DYNAMICS
J. LATHAM, Victoria Univ. of Manchester, Inst. of Science & Technology, *Manchester, England, United Kingdom* (DN475237; N00014-77-G-0027)

The objective of this research is to work out the most advantageous combination of drop sizes, charging, and dispensing techniques for the dispersal of warm fog for the benefit of naval flight operations and better performance of EOMET systems.

This work is accomplished through preliminary laboratory experiments with various size drops and charges. These experiments are then taken into the field for trial.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0030, REMOTE SENSING RESEARCH FOR LINE OF COMMUNICATION IDENTIFICATION
A.O. POULIN, U.S. Army, Remote Sensing Center, *Fort Belvoir, Virginia* 22060 (DA0N8006)

To develop methods for obtaining more rapid and accurate information of factors affecting lines of communication (LOC) in a tactical battle area. This includes cut and fill, airfields, construction material, ice bridges, etc., to evaluate and develop new procedures for using new imagery sources to derive the above information.

Representative geomorphological areas of Europe will be selected. the factors will be evaluated with respect to each area. First-year effort will concentrate on soil and rock evaluation for cut and fill, airfield site selection, and construction material site selection. As time becomes available, the remaining factors will be evaluated. Doctrinal awareness will enable the investigator to recommend modification to doctrine where necessary, and to develop LOC keys relevant to types of vehicles expected to operate in a given environment. Research results will be disseminated in briefings, interpretation keys, in-house technical reports and, where necessary, technical manuals.

SUPPORTED BY U.S. Dept. of Defense, Office Chief of Engineers, Engineer Topographic Lab.

5.0031, IMAGE REFERENCE SET FOR AUTOMATED TERRAIN DATA EXTRACTION
T.C. VOGEL, U.S. Army, Geographic Info. Systems Div., *Fort Belvoir, Virginia* 22060 (DA0M8068)

To acquire a set of representative aerial images and ground truth to provide input for quantitative test and evaluation of hardware and software associated with automated feature extraction and to develop the capability to duplicate the reference imagery to the required fidelity in photographic form.

Collect, document, and format in digital and/or photographic form, a reference set of images representing the range of USAETL problems, terrain types, aerial sensors, image scales, imaging dates, etc. Collect spectral reflectance data for a prioritized, finite set of features. Develop the capability to duplicate images from the reference set so that results of processing of the same image on different hardware/software systems can be compared objectively and without qualification for image condition. Reference image sets will include panchromatic, LANDSAT photography, thermal IR, radars of various frequency, etc.

SUPPORTED BY U.S. Dept. of Defense, Office Chief of Engineers, Engineer Topographic Lab.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, DEVELOPMENT AND TEST OF AN AIRCREW SIMULATOR CERTIFICATION PLAN FOR USE IN TAC
L.D. POHLMANN, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222900)

To develop a systematic procedure for obtaining a quantitative measure of the training capability of a training device. The resultant procedure will be used to establish and validate the training effectiveness of both the training device and the program of instruction to be used with the device. Additionally, the program of research should identify and define any policy changes which may be required (i.e., credit for simulator time).

This effort will use as inputs the results of other ongoing research efforts. The general approach of these ongoing efforts will be to (1) identify and define the tasks of a particular aircrew, (2) define the criterion reference objectives for these tasks, (3) assess which performance objectives may be taught employing the training device, (4) develop the instructional program which specifies how the training device is to be used, and (5) validate the resultant instructional program in an operational training setting. Initial efforts will be centered around devices which are presently in various stages of OT&E (F-4E WSTS-18, SAAC, F-15, FS1). This effort will impact these OT&Es as well as other research efforts to insure that such efforts provide usable inputs to the certification project to the maximum extent possible. Attempts to develop a procedure suitable for use with the above devices should provide inputs for the development and refinement of a procedure which has more general applicability.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, SKILL DEGRADATION
G.B. REID, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF223340)

To monitor the decline in performance on a high-fidelity aircraft simulator during extended periods of non-practice.

Pilots currently in non-flying jobs will be used as subjects. Subjects will be trained to a predetermined performance level on the Advanced Simulator for Pilot Training (ASPT). Rechecks will be conducted in ASPT after varying levels of non-practice to determine rate of skill degradation. The performance will be evaluated in respect to such pilot factors as amount of flying time, type of aircraft flown, and most recent aircraft currency.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, EFFECTS OF VARYING DISPLAY PARAMETERS ON TRAINING IN THE T-4G T-37 FLIGHT SIMULATOR
R.R. WOODRUFF, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF221810)

To investigate the effects of changing various engineering parameters of the T-4G (a T-37 flight simulator) on the training of Air Force undergraduate pilot trainees. Projects selected will complement future ASUPT research by investigation of variables which are fixed on ASUPT. Immediate plans are to evaluate the effect of black and white compared to color imagery and collimation compared to non-collimation of the image.

ATC instructor pilots will train groups of new student pilots to land the T-4G before they begin T-37 training. Separate, matched groups will receive equal training (i.e., number of trials) with different conditions (color, black and white, collimation, non-collimation, etc.). Students' performance at the end of training will be evaluated for differences or similarities in group scores. Performance will be measured in two ways: (1) IPs will evaluate performance using a 12-point scale like that developed for use in FFT studies, and (2) ADACS (automated data acquisition and control system) will be used to record several flight parameters. ADACS measures will be correlated with IP evaluations to determine which ones are most indicative of student performance and those selected will be used in subsequent analysis.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0004, MODELING BIODYNAMIC EFFECTS OF VIBRATION ON PILOT CONTROL
H.R. JEX, Systems Technology Inc., *Hawthorne, California* 90250 (DF036930; F44620-73-C-0075)

AF function - in the course of world-wide operations, Air Force personnel are exposed to a wide range of environmental stresses which seriously limit mission performance. Vibration is one of those stresses receiving increasing attention due to the number of low-altitude, high-speed flights, transonic buffeting of fighter pilots affecting the use of helmet-mounted sights, and the increased use of vertical/short takeoff and landing aircraft. Deficiency - technology for modeling, analyzing, simulating and designing man-machine systems in these biodynamic situations is needed. Objective - determine basic mechanisms and develop models of vibration interference and develop predictive and analytical systems for design criteria. How work contributes - this research should lead to models to assist in establishing design criteria and is identified in RO 1.6 'Mechanical Forces'.

Available dynamic systems identification and analytical methodologies will be used.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0005, REPORT ON PRESENT STATE OF KNOWLEDGE OF NEUROLOGICAL/NEUROSURGICAL CONDITIONS
UNKNOWN, Amer. Medical Assn. Educ. Fdn., *Chicago, Illinois* 60610 (FA77WA-4076; FA160418 (TRAIS NO.))

The Office of Aviation Medicine has determined that it needs an authoritative statement concerning the current state of knowledge regarding selected neurological/neurosurgical conditions. This information is required in connection with a continuing review of regulatory standards, examination procedures, and airman certification decisions involving neurological/neurosurgical conditions in airman applicants.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

6.0006, ELECTRONMICROSCOPY OF TOXIC CHEMICALS

R.S. WEINSTEIN, St. Lukes Hosp. Center, *Chicago, Illinois* (DF319860; F33615-76-C-0504)

There is a continuing need to understand the fundamental mechanisms by which the human organism is damaged following exposure to harmful chemical substances. A full understanding of the mechanism of action is necessary before one is able to counteract toxicological injury by the protection of the most vulnerable links in the chain of intricate regulating mechanisms within the body. This effort is designed to study the effects of candidate fire extinguishing agent, freon 1011, as it affects liver cell membrane characteristics by use of electron-microscopic techniques.

Computer programs will be developed to enable a computer-controlled optical scanner to identify cellular components that may be the targets of harmful haloalkanes in the body. These programs will be linked to existing morphometric computer programs as the next step in an ongoing effort to automate the evaluation of pathologic alterations in toxically injured tissues. Morphometric ultrastructural techniques will be utilized for quantitative toxicological evaluation of alterations in microsomal membranes in liver induced by the hand-held extinguisher agents, freon 1211 and freon 1011. Recently developed electron-microscopy techniques will be used to further evaluate alterations in the internal organization of microsomal membranes in toxically injured liver of test animals. The data will be used to develop occupational exposure criteria for Air Force operations as required by AFR 161-18.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0007, DYNAMIC RESPONSE OF VERTEBRAL ELEMENTS RELATED TO USAF INJURY

J.F. LAFFERTY, Univ. of Kentucky, School of Engineering, *Lexington, Kentucky* 40506 (DF046790; F49620-77-C-0043)

AF function - effective ejection of aircrew members from high-speed aircraft requires the maximum acceleration permitted by human tolerance. This implies the optimal combination of restraint and orientation, seat configuration and acceleration profile. Deficiency - observations indicate that most of the irreversible damage sustained during ejection is related to the vertebral column. Knowledge of the dynamic material properties of the spinal elements is lacking. Objective - this research will determine the load distribution and stress-strain characteristics of the vertebral joints normal and at right angles to the spinal axis. How research contributes - the tests proposed are unique and will integrate into the AMRL program dealing with vertebral unit strength and interspecies scaling relationships. Results will provide previously unavailable data on spinal column strength. This research is identified in subarea 1.6 'Mechanical Forces'.

Stress-strain characteristics will be determined as a function of strain rate for shear, bending, torsion and tension.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0008, INVESTIGATION OF SIGNAL ANALYSIS TECHNIQUES FOR ECG/VCG CLASSIFICATION

D.E. GUSTAFSON, Charles Stark Draper Lab. Inc., *Cambridge, Massachusetts* 02139 (DF318720; F41609-76-C-0009)

The USAF Central Electrocardiographic (ECG) Library, established to assist in the validation of criteria for the selection/retention and medical maintenance of flying personnel, has, to date, accumulated more than 760,000 individual ECG records. The purpose of this contract is to continue development of algorithms, based on signal analysis techniques, for classifying both electrocardiograms and vectorcardiograms (VCGs). This is the fourth step in a continuing research program, the ultimate objective of which is the automated separation of ECGs into abnormal and questionable categories. It is anticipated that successful completion of this contract will result in the extension of present algorithms and development of new algorithms.

The overall research approach will consist of two categories of investigation, with all development work evaluated using actual ECG/VCG data. (1) Further investigation of feature extraction using Karhunen-Loeve (K-L) expansion and determination of the appropriate ensemble correlation matrix. (2) Investigation of clustering techniques by means of unsupervised learning to investigate 'natural' clustering of data, employment of supervised learning based on cardiologist diagnoses to enhance class separability, and a combination of both the above to give overall best class separation in feature space and maximize pattern recognition accuracy.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0009, INVESTIGATION OF SIGNAL ANALYSIS TECHNIQUES FOR ECG/VCG CLASSIFICATION

M.E. WOMBLE, Scientific Systems Inc., *Cambridge, Massachusetts* 02138 (DF320400; F33615-77-C-0606)

Over the past four years, computer algorithms have been developed for digitizing and preprocessing vectorcardiograms (VCG), compressing the data so that it can be efficiently transmitted via commercial grade telephone lines, and classifying VCGs into normal and a selected set of abnormal categories. In addition, computer algorithms have been developed for detecting and identifying various categories of arrhythmias. These algorithms have been assembled into a prototype version of an overall VCG interpretation system which is operational on the USAF San Antonio Data Services Center (USAFSADSC) IBM 360-65 computer. The objective of this effort is to extend the currently utilized algorithms and to develop new algorithms for interpretation of VCGs based on experience gained with the operational prototype VCG interpretation system. This is an extension of the work done under 77550112.

Algorithms developed for detecting and classifying arrhythmias via r-r intervals will be extended to include p-r intervals. K-L expansions will be performed separately on the p and qrst segments of VCGs. Investigations of the tendency of VCG pattern vectors to cluster in feature space will continue. Computer algorithms will be developed for calculating the eigen values and eigenvectors of large matrices.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0010, BIODYNAMIC RESPONSE

A.I. KING, Wayne State University, School of Engineering, *Detroit, Michigan* 48202 (DN123393; N00014-75-C-1015)

The objectives of this research program are to use both experimental and analytical techniques to study the biodynamic response of naval aircraft occupants subjected to either forward or rearward deceleration. In particular, mathematical models simulating various impact modes are formulated and then validated against experimental data. Existing models are also being evaluated and modified to improve their performance.

Two different spinal models are currently being developed. A two-dimensional model with muscular response has been formulated and exercised to simulated g sub z, (seat-to-head) acceleration. The muscle model was based on electromyographic data obtained from experiments with canine subjects which were impacted at 3 to 5 g to elicit a proprioceptive response. Concurrently, a three-dimensional spinal model is also being formulated to simulate a general spinal response to an arbitrary input. The model assumes the vertebrae as rigid bodies and has the capability of simulating coupled motion between vertebrae. It can also model the articular facets, the seat pan and back, and belt-type restraint systems.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

6.0011, BIODYNAMIC DESIGN CRITERIA FOR EMERGENCY ESCAPE SYSTEMS

J.W. BRINKLEY, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF312330)

To develop acceleration exposure limits and protection equipment requirements for operational and advanced ejection seats and crew escape modules. The effort will result in the development of new escape system specifications and upgrading of existing specifications in the U.S. Air Force Aerospace Systems Development Program in order to minimize personnel injury during emergency escape.

Acceleration and windblast environments currently experienced with operational escape systems or predicted for advanced systems will be studied analytically and experimentally to develop human exposure limits. The exposure limits will be expressed in terms of mathematical analogs and verified by comparison with current operational injury rates associated with specific environments and by tests using human subjects. The resulting analogs will be used to study the degree of protection or hazard provided by specific personnel equipment configurations. The study results will be verified experimentally.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0012, AIRCRAFT PERSONNEL RESTRAINT SYSTEMS IMPACT DYNAMICS

J.W. BRINKLEY, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF320450)

Current military personnel restraint system specifications require tests to determine only ultimate static breaking strength of restraint webbing material to evaluate the adequacy of restraint systems during impact. Since restraint materials are sensitive to strain rate and the dynamic response of the human body amplifies impact loads, existing static test requirements are inadequate to insure crew protection during emergency escape or aircraft crash. Recent AFSC IG findings cite unresolved technical controversy regarding the effect of webbing properties on crew protection. The objectives of this research are to (1) determine the influence of the mechanical properties of restraint systems during impact, (2) provide biodynamic data for restraint design and dynamic test criteria and (3) acquire data for a computer model of the human body and restraint components to predict crew responses to impact environments.

The kinematic and inertial responses of volunteer subjects will be measured in a series of minus g x impact tests with three acceleration levels and three restraint harnesses. Static and dynamic tests of the restraint webbing will determine their mechanical properties. The stiffness of the harnesses will vary from 500 to 12,000 lbs/in. Human kinetic and kinematic responses will be predicted using a mathematical analog, the articulated total body model.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0013, VISUAL PERCEPTION THROUGH WINDSCREENS

F.E. GOMER, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321120)

To relate the optical characteristics of aircraft forward transparencies to specific aspects of visual performance. F-111 and B-1 windscreens, as well as transparencies with new geometric configurations will be evaluated. Optical deficiencies include distortion, binocular disparity, multiple imaging birefringence coloration and transmission loss. The ultimate goal of this work unit will be the development of a set of visual perception measures to be used in acceptance testing of aircraft windscreens. These measures will influence the selection of optical tests. Data collected under this work unit using these measures will form the basis for setting of optical specifications. This effort supports AFSC development goal MS-4 and TN-ASD-AMRL-0602-72-56, minimum vision requirement for transparencies.

Through ground-based laboratory experimentation, this research program will be directed toward the determination of performance limiting changes in visual perception produced by optical deficiencies in aircraft windscreens. Results will be interpreted with respect to measures of windscreen optical quality. Examination of the effects of optical distortion requires tests of: (a) visual acuity, both static and dynamic, (b) motion perception in terms of movement thresholds, velocity estimations, and two-dimensional eye-tracking accuracy, (c) distance perception with respect to static and dynamic targets, and (d) depth perception, both near and far field. The distracting influence of multiple imaging will be investigated by monitoring three-dimensional eye-tracking accuracy, while birefringence coloration effects will be determined by measuring the changes in accommodation that are produced. For all testing situations, short-term viewing influences will be differentiated from long-term viewing influences. Visual quality inspection process will be categorized, psychometrically quantified and related to optical, pilot and laboratory performance measures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0014, PULSE DENSITY MODULATION

T.C. HARTRUM, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321480)

The objective of this effort is to develop the theory of operation of pulse density modulation, and to evaluate this modulation technique as a communication system. Pulse density modulation is a stochastic modulation technique based on the operation of biological neural systems. The communication system will offer advantages in security, jamming resistance, and per channel bandwidth reduction.

A feasibility model of a pulse density modulator/demodulator system has been built based on experimental measurements of physiological systems. This hardware will be used to guide theoretical development and to verify theoretical results. Based on these results, improved receiver design will be proposed, and system performance will be evaluated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0015, MECHANISMS OF NONDESTRUCTIVE COUNTERMEASURES AGAINST THE HUMAN VISION SYSTEM

E.J. HARTZELL, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF318860)

At some point in effective threat systems, there is at least one human operator serving in a primary or backup role as a system controller. The human operator controls his system on the basis of visual information about the position and relative motion of the target. The objective of this effort is to investigate psychophysical mechanisms which may be effective countermeasures against the human vision system. The work will be coordinated with the AF Avionics Laboratory and the Navy Missile Test Center, Point Mugu, CA. The results of this effort will relate the mechanisms underlying successful empirical experiments conducted in the past and in progress jointly sponsored by these organizations as well as the Army.

The approach involves a series of human experiments utilizing the computational and simulation facilities at the AMRL. Human performance will be evaluated, presence of potential countermeasures, including frequency of flashing lights, signals having patterns or cognitive value, varied signal intensity and varied wavelength. Of particular concern are the display media and task viewing mechanisms.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0016, MODELLING OF HUMAN RESPONSE TO AERODYNAMIC FORCE

I. KALEPS, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF322950)

Exposure to a high-speed wind stream during ejection from an aircraft poses a serious threat to the safety of the ejectee. Methods are needed for assessing the extent of this hazard under various flight conditions and for different ejection modes and systems. This program seeks to provide an analytic methodology for predicting human body response to wind forces encountered during ejection from aircraft. It will deal with both experimentally and theoretically specified aerodynamic environments in providing body response predictions.

The main modeling emphasis will be placed on the development and refinement of the articulated total body (ATB) model and the preparation both from separate experimental programs and by theoretical means of quantitative specification of the aerodynamic environment surrounding the human body during ejection. The model will be applied to predict body limb motion resulting from the prescribed aerodynamic environments. It will also provide predictions of stresses and torques within the major long-bone joints and estimates of probable injury resulting from limb excursions outside of normal ranges of motion.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0017, PILOT MODELS FOR PERFORMANCE MEASUREMENT

P.A. KNOOP, U.S. Air Force, Human Resources Laboratory, *Dayton, Ohio* 45433 (DF228090)

To determine which pilot modeling techniques are compatible with the objectives of performance measurement and to develop a rationale for performance measurement through modeling which will guide future work in this area. The work is in support of an effort to explore and exploit the measurement potential of pilot modeling methods for application in instructor station design and simulation R&D.

The approach is to first conduct a survey of existing pilot modeling techniques by both a literature review and coordination with organizations actively engaged in pilot modeling research. The principal advantages and shortcomings of each technique, with respect to applications in performance measurement, will be identified, and the extent to which each technique accurately incorporates contemporary behavioral theories will be assessed. Those techniques with greatest potential payoff for measurement applications, along with related research voids, will then be identified. Milestones are as follows: (1) survey technical literature and on-going pilot modeling work, 30 Apr 76, (2) develop summary of existing modeling techniuqes, 31 May 76, (3) complete analysis of modeling methods with respect to measurement potential, 31 Oct 76, (4) develop documentation (TR), 5 Jan 77.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0018, HUMAN OPERATOR MODELING FOR MULTIPLE-TASK NONSTATIONARY NOISE CASE

E.K. LINDBERG, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF138490)

This work unit supports the human operator modeling effort in AFFDL. This work will address nonlinear models and nonstationary noises as driving functions for these models and on observations from these models. This should generalize existing modeling to include such tasks as gun firing, and aircraft maneuvering. The objective is to define a model that approximates a time history of the pilot's performance. This model could examine corners of the flight envelope of aircraft-man systems not considered before. Such things as stability and response of the aircraft-man in nonlinear regions of the flight envelope can be considered.

The controller will be formulated around the limitations of the human as a controller and based on estimates provided by an extended Kalman filter. To facilitate computation, certain elements of the linearized equations will be considered as parameters and the controller will be determined using various treatments of these parameters.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

6.0019, PERFORMANCE LIMITS OF EAR INSERT COMMUNICATIONS

R.L. MCKINLEY, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321350)

Air and ground crew voice communications are degraded by high-level environments that exceed the performance limits of present standard communication equipment creating command and control problems and safety hazards in routine as well as emergency situations. The objective of this effort is to establish the communication and protection performance limits in high-intensity noise environments of the ear insert communications concept. This effort will benefit ASD Life Support SPO and ground crew effectiveness and safety by identifying noise exposure envelopes within which the ear insert communications concept will provide adequate hearing protection and satisfactory voice communication.

The approach incorporates the laboratory simulation of specific aircraft noise environs, the progressive evaluation of ear insert units at increasingly intense levels of these environs by measurement of hearing protection characteristics and then communication effectiveness. A hearing protection/voice communication envelope of the performance limits will be developed based on these data for both monaural and binaural configurations of the ear insert receiver and compared to the performance of current standard items.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0020, SPECIALIZED ELECTRONIC INSTRUMENTATION FOR MANNED SIMULATION

D.A. RATINO, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF322470)

Highly specialized prototype electronic devices are needed for TPO 7 human performance research. The production of these highly specialized one-of-a-kind items within an in-house work unit has many benefits to the Air Force including reduction of manhours and material costs, time savings, enhanced coordination with users, and minimum administrative efforts. The items to be produced will be determined by the needs of the research teams. The first item under this new work unit will be the development of specialized electronic circuits for use in a radar simulator display.

Prototype electronic devices will be designed, fabricated, and bench tested in support of Division research projects.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0021, HUMAN ENGINEERING SUPPORT GO FBU-15

J.M. RING, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321010)

The GBU-15 (V)/B modular guided weapon system is a family of weapons comprised of two distinctly different aerodynamic configurations, different guidance systems, autopilots, warheads, fuzes, and an optical data link. There are more than 28 different configurations involved, with the Air Force procuring the modules and assembling them according to the theatre commander's assessment of the demands of the operational situation. The main objective of this effort is to provide human engineering support to ensure that blue-suiters can assemble the weapons in any of the required configurations, test and checkout the resulting configurations, upload, operationally use the weapon, download if necessary, and maintain the modules. The entire program is scheduled through FY 82. ADTC/SD15 is providing travel funds for the AMRL human engineering team and contractual funds for an on-site human engineer under the monitorship of the AMRL team.

The effort is paced by the schedule and directives pertinent to the GBU-15 (V)/B system and the development of major modules and components which comprise the system. The approach is to review appropriate specifications, drawings, and hardware (where available) to ascertain that the operational user can efficiently and effectively build up, test and check, and operationally employ the weapon. Program reviews and design reviews are attended and comments and suggestions made for more efficient and effective human use. Consultation with any or all of the 10 or more contractors involved, with appropriate ADTC, TAC, SAC, AFLC, AFTEC, ASD and ATC cognizant personnel is a continuing requirement.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0022, SUBJECTIVE EFFECTS IN MOIFE
R.W. SHOENBERGER, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321240)

To investigate the subjective effects of whole-body vibration in the pitch, roll, and yaw axes and in multiaxis environments. Subjective response data are available for the three translational axes (x, y and z) and this effort will extend that knowledge to rotational vibrations and to environments with simultaneous oscillations in (or around) more than one axis. The information obtained will result in improved and expanded vibration criteria for evaluating aircrew exposure to operational multiaxis oscillating inertial force environments, and provide data for improved crew station design to alleviate adverse vibration effects.

Psychophysical measurement techniques (e.g., psychophysical matching and magnitude estimation) will be used to evaluate the severity of vibration inputs. Subjects will be exposed to single-axis angular vibrations (pitch, roll and yaw) as well as combined multiaxis inputs in both translational and angular modes. Subjective intensity comparisons will be made using single-axis translational vibrations (for which there are existing criteria) as comparison standards. Data analysis will provide assessment of the subjective effects of angular vibrations in relation to translational motion and techniques for evaluating the subjective intensity of multiaxis vibrations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0023, M&O IN SUPPORT OF RESEARCH ON TRACKING PERFORMANCE IN MOIFE
G.T. COLLINS, Univ. of Dayton, Res. Inst., *Dayton, Ohio* 45409 (DF322520; F33615-76-C-0401)

Effects of chronic and acute exposure of humans to vibration stress are not sufficiently well understood to permit optimal weapon system design. The primary goal of this effort is continued safe operation of the branch's motion simulators in support of in-house research. Emphasis on in-house control of experiments with human subjects dictates that protocols and interpretation of reduced data be controlled by Air Force personnel. Additional research is therefore aimed at obtaining support in carrying out approved protocols, obtaining data, and improvement or modification of simulators to give special environmental simulation.

The contractor will (1) establish and/or maintain safe operational procedures for all branch motion simulators and power supplies in operational status, (2) provide continuing operational and engineering support for said simulators and power supplies, (3) provide research into special instrumentation required for experiments carried out on said simulators, (4) provide data collection, reduction and analysis support for experiments carried out on said simulators, (5) provide research required to modify said simulators their power supplies or their control systems when special environmental simulation is foreseen, (6) provide orientation in operation and maintenance of branch motion simulators to otherwise qualified newly assigned in-house personnel. This work unit represents that 50 percent of contract F33615-76-C-0401 which will be devoted to 'support of research on tracking performance in multiaxis oscillating inertial force environment (MOIFE).' The other 50 percent of the contract is documented under 72310170, 'support of research on visual performance in multiaxis oscillating inertial force environments (MOIFE).'

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0024, BIOMECHANICS FOR COCKPIT DESIGN
S.M. EVANS, Univ. of Dayton, Res. Inst., *Dayton, Ohio* 45409 (DF317180; F33615-77-C-0505)

To improve USAF's capability to provide human engineering support to the design and evaluation of crewstations by automating the complex operator/machine interaction by means of a three-dimensional interactive graphics computer model. To automate the handling of body size variability data to improve the utility of these data to guide the design of AF systems and equipment. To provide computer techniques for evaluating the effects of flight clothing on operator's interaction with the crewstation. To provide computer methods for sizing and design of personal-protective equipment.

The accuracy of the enfleshment equations for the COMBIMAN (computerized biomechanical man-model) will be validated and equations for simulating personal-protective equipment on the man model dimensions and mobility characteristics will be developed and validated. Techniques for realistic movement and an automated reach-task analysis will be developed. AMRL's force testing devices will be used to obtain strength data for the design and placement of controls in crewstations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0025, MANPOWER IMPLICATIONS IN THE DESIGN OF AIR FORCE EQUIPMENT
M.L. RITCHIE, Wright State University, School of Science & Engin., *Dayton, Ohio* 45431 (DF037400; AF-AFOSR-2569-73)

AF function - the AF must provide an improved methodology for estimating and controlling manpower costs involved in the acquisition and operation of new systems. Deficiency - there are no currently available models or methods for forecasting the personnel and training costs of new systems, and no techniques for estimating the manpower costs of engineering design trade-offs. Objective - this research will identify characteristics of the systems engineering design process that can be manipulated to reduce the personnel and training components in the life-cycle costs of major aero systems. How work contributes - this study will support the program of the Human Resources Laboratory that is undertaking a major thrust to develop effective methods for the reduction of personnel costs in systems acquisition and operation. The research relates to RO's 1.1, 1.2 and 1.4 and the results will be directly used in high-priority laboratory programs that support objectives of ASD and the Flight Dynamics Program of AFWAL.

The research will methodically review and/or define such variables as support manpower figures in life-cycle costing, the use of contractor warranties in Air Force equipment acquisition, the assignment of values in trade studies, the nature and influence of work statements on equipment design, and the analysis of manpower costs in life-cycle costing.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0026, THERMAL PROTECTION FOR FLIGHT CREWS
A.M. STOLL, U.S. Navy, Crew Systems Department, *Warminster, Pennsylvania* 18974 (DN581425)

To provide (1) thermally safe operating conditions for aircrews in normal flight in current and advanced design aircraft, and (2) protection from thermonuclear weapons effects in unconventional warfare operations. Requirements for thermal protection are indicated in the naval aviation biomedicine/human effectiveness technical workshop report for FY 74.

Basic data will be obtained on the production of pain and burns on contact with a wide variety of materials of different thermal properties. From these data a mathematical formulation will be derived for predicting the maximum permissible temperature of any material for safe contact with bare skin solely from a knowledge of the thermal constants of the material. Additional studies will be made to delineate the limits of non-injurious exposure to thermal effects of the high-intensity non-ionizing radiation from nuclear weapons in the projected shirt-sleeve environment to constitute a basis for providing protection where necessary.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Medical Research Institute

6.0027, VALIDATED DENITROGENATION PROCEDURES FOR HIGH-ALTITUDE OPERATIONS
J.D. ADAMS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322300)

This effort will develop more effective procedures for the prevention of decompression sickness during exposure to potential decompression hazards. A significant number of cases of decompression sickness occur each year in USAF and other aerospace operations. This suggests current procedures for its prevention are not optimally effective. In addition, unusual condi-

tions have arisen where established denitrogenation schedules do not exist or are ineffective, such as flying after driving, minimum frequency of high-altitude exposure, the impact of interruption in denitrogenation, differences between male and female denitrogenation rates and prebreathing with less than 100 percent oxygen for on-board oxygen generating systems. Past efforts of defining decompression hazards and establishing preventative measures, have used empirical and subjective testing of humans in altitude simulators with symptoms of decompression sickness being an endpoint. Recent advances in technology have provided the ability to use non-invasive methods to develop required preventative criteria. These new methods are not only more precise but involve less risk to human subjects and are lower in cost. This effort will be directed towards the development and use of these objective techniques to develop more optimal preventative measures in a wide variety of current aerospace decompression problems.

The value of non-invasive techniques to monitor the condition of human volunteers both during the prebreathing and the actual exposure phases of simulated high-altitude missions will be tested. During the prebreathing phase, nitrogen washout will be monitored, and during the altitude exposure phase bubble formation will be studied. Human subjects will be tested by a non-invasive technique for monitoring and evaluating the state of denitrogenation under various aerospace operational profiles. Denitrogenation curves will be used to evaluate and establish oxygen prebreathing criteria for various missions including those employing 100 percent oxygen or gas mixtures from on-board oxygen generating system. Specific efforts will include: establishment of minimum safe excusal period between repeated high-altitude exposures, determine whether 15 min or 30 min denitrogenation schedule should be used before physiologic training flights, evaluate the effects of airbreathing interruption in denitrogenation, and determine effects related to individual human characteristics.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0028, AEROMEDICAL EVACUATION EQUIPMENT

M. CHANDLER, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322090)

To test and evaluate newly developed (commercial or in-house) items of medical material to determine their effectiveness in aeromedical evacuation. The Biomedical Systems Branch has an ongoing program of evaluating medical material items to satisfy identified operational requirements for aeromedical evacuation. Performance criteria have been established to insure that medical equipment items meet stated operational requirements. Current state-of-the-art of medical material technology will be continually assessed.

The test program normally consists of six major areas, patient-user safety, operational specifications, environmental effects, electrical and mechanical characteristics, and human factors. Each area is subdivided into specific engineering tests or evaluations. When the test program is completed, the results are compiled and a report is sent to the field. The information is kept on file and updated or modified as user test reports are received. This is a continuation of part of the work formerly documented under work unit 7755-15-02.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0029, ANALYTICAL METHODS FOR ENVIRONMENTAL ASSESSMENT OF VOLATILE NITROSAMINES

J.P. CONKLE, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF320880)

This work unit will develop, test and evaluate sorbent and extractive sampling methods for detection and quantitative measurement of n-nitrosodimethylamine (NDMA) in ambient air, soil and water media. NDMA is an intermediate in the industrial synthesis of unsymmetrical dimethylhydrazine (UDMH) rocket fuels, and is one of the carcinogenic compounds controlled by OSHA. This development effort is essential to provide cost-effective sampling/analysis procedures to ensure environmental safety of continued UDMH production. This effort supports the AFLC (SAALC/SF) procurement of UDMH rocket fuel. This effort was previously documented under 7164-16-27.

Cold-trap, impinger and sorbent tube NDMA-sample collection methods will be compared against various analytical procedures including wet chemistry, chromatography, and chemiluminescence (thermal energy analysis) to establish an artefact-free referee method for air, water and soil media. Standardized sampling methods will be transitioned to the Air Force Occupational and Environmental Health Laboratory (OEHL) for routine air monitoring in FY 77, and for routine soil/water monitoring in FY 78.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0030, REEVALUATION OF THE WEIGHTED AIRMAN PROMOTION SYSTEM FOR GRADES E5 THROUGH E7

C.D. GOTT, U.S. Air Force, Human Resources Laboratory, *San Antonio, Texas* 78236 (DF233090)

To reevaluate the six factor weights of the current weighted airman promotion system (WAPS), to evaluate the effect of using decorations in current grade instead of the total decorations factor in WAPS, to consider NCO Leadership School, NCO Academy, Community College of the Air Force, and other job-related education courses as additional factors in the promotion system, and to examine whether or not a separate weighted formula should be established for those AFSCs which have no specialty knowledge test.

To accomplish the objectives, an experimental promotion policy board consisting of six officers (O-5/O-6) and six NCOs (E-8/E-9) will be convened at AFHRL to review the records of a random sample of E-5 airmen eligible for promotion to E-6. The board will rank-order the sample for promotion with respect to the following selection factors: (1) specialty knowledge test, (1) promotion fitness examination, (3) time-in-service, (4) time-in-grade, (5) total decorations, (6) airman performance reports, (7) decorations in current grade, (8) NCO Leadership School (9) NCO Academy, (10) Community College of the Air Force, and (11) other job-related education courses. Various combinations of selection factors will be displayed to the experimental board. Policy-capturing techniques, i.e., regression analysis and hierarchical grouping procedures, will be used to analyze the rankings of the board members. Milestones: 11 Mar 77, completion of all preparations for convening the experimental board; 14-19 Mar 77, meeting of the experimental board at AFHRL; 15 May 77, completion of data analysis phase; 30 Jun 77, staff report including descriptions of alternative systems; 31 Jul 77, publication of technical report concerning reevaluation of WAPS. 31 jul 77, identification by DPXXOP to AFHRL/SM of alternative systems for impact analysis. 30 Sep 77, completion of impact analysis using FY 77 promotion data; 15 Nov 77, staff report describing impact analysis; 31 Dec 77, publication of technical report concerning impact analysis.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0031, VALIDATED TEST PROCEDURES FOR THE ACCEPTANCE AND OVERHAUL OF OXYGEN DELIVERY EQUIPMENT

R.D. HOLDEN, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF323170)

Current test procedures for the acceptance and overhaul of oxygen delivery systems utilize antiquated test equipment that does not realistically represent the user's respiratory needs. The increasing complexity of life support equipment dictates that testing and overhaul procedures keep pace with new methods and technological advancements. A logical starting point in the upgrading of present test procedures would be consideration of criteria from the standpoint of actual user respiratory need. In FY 78-79 validated procedures for the testing of oxygen regulators for acceptance and, after overhaul, will be provided to Oklahoma City ALC as a basis for test equipment that truly represents the very broad spectrum of individual respiratory requirements. Previously documented under 79301307.

Quality control, overhaul methodology, functional testing and life-cycle cost are essential considerations in the development

process. Through a close continual relationship between development and logistics organizations optimal performance criteria can be developed. Current liaison with Oklahoma City and San Antonio ALCs will be nurtured and become more extensive in the future. The oxygen regulator test stand with its various components, the human breathing/metabolism simulator and the analytical data acquisition and control system will be the primary equipment utilized in this effort. It is anticipated that with equipment of this sophistication level a wealth of data can be acquired and developed not only for recommendations, but also for creation of realistic operational performance standards. Through cooperative efforts and interface guidance with the two ALCs, validated test procedures for the acceptance and overhaul of oxygen delivery equipment can be accomplished.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0032, TRI-NATION EVALUATION OF AVAILABLE ALTITUDE PROTECTION TECHNOLOGY
R.W. KRUTZ, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322630)

The advent of advanced concept fighter and multi-role combat aircraft has both broadened the spectrum of hazards to which aircrew are potentially exposed and led to a convergence of crew-protective philosophies among NATO allies. The US, Britain, and Canada all share requirements to protect aircrew during high-altitude intercept, reconnaissance, or weapons delivery roles. However, only outdated, cumbersome and often dangerously compromising gear, using a variety of protective concepts and equipment combinations, is available for such needs. To assure the observance of critical minimum protective standards, Working Party 61 (of the Air Standardization Coordinating Committee) has ratified AIR STD 61-011, a document which defines pressure-garment design and use criteria. To assure compliance with such guidance, together with developing a data base useful in updating/revising present recommendations, this effort will provide for continuing tri-nation cooperation in evaluation of available altitude protection technology. Previous work in this area has been documented under work unit 7164-11-01; the present work unit has been established by direction of HQ AMD to implement a new technology planning objective.

This organization has established appropriate liaison with the RAF Institute of Aviation Medicine (IAM) and Canada's Defense and Civil Institute of Environmental Medicine (DCIEM). Cooperative evaluation of selected in-service prototype garments will be conducted with test responsibilities divided among participants in a manner taking best advantage of the facilities/expertise available within each organization. Data obtained from tests of flying gear will be used to assess its compliance with existing guidance, determine suitability for use in specific flying roles and form a data base useful in future equipment design.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0033, EEG ABNORMALTIES AND NEUROLOGIC SEQUELAE
J.J. ROBIN, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF321700)

The objective is to refine the definition of normal/abnormal states and apply these data to flying personnel on a short and prolonged basis. Certain electroencephalographic phenomena seem correlated with clinical conditions and occur after such events as head trauma. But the meaning of these findings in asymptomatic individuals with no relevant history and normal physical findings is uncertain. Long-term followup of a group of subjects with these findings is indicated in order to study the meaning of these EEG phenomena in otherwise normal individuals.

All aircrew undergoing evaluation by the Aeromedical Consultation Service routinely have electroencephalography with hyperventilation and photic drive. Additionally, sleep-deprived EEGs are obtained if there is any evidence of abnormality which is not clearly disqualifying for flying duties. EEGs are interpreted in accordance with Air Force aircrew standards and those subjects not meeting those standards are disqualified for flying duties. All of the last 100 such EEGs will be reviewed by the primary investigator for accuracy of interpretation. An attempt to reach the subjects involved will be made by mailing them questionnaires to assess their current clinical status and job experience. Similar questionnaires will be mailed to a matched group with normal EEGs. Data will be analyzed to differentiate those findings which are predictive of disability for flying duty. This effort was formerly documented under work unit 7755-04-08.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0034, SIGNIFICANCE OF ARTERIOGRAPHIC MINIMAL CORONARY ATHEROSCLEROTIC HEART DISEASE IN THE AIRCREW MEMBER
J.H. TRIEBWASSER, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF321920)

Minimize the number of flyers who must be grounded because of the presence of minimal coronary artery disease that is functionally insignificant, establish techniques to detect disease progression/regression, evaluate the effect of risk factor modification on the progression of the disease, and establish the significance of given lesions on long-term prognosis for the purpose of establishing retention criteria.

Aircrew members identified as having minimal coronary atherosclerotic heart disease (i.e., a degree of obstruction associated with a coronary event rate that is no greater than that observed in an apparently healthy similar aged population not subjected to cardiac catheterization) will be followed longitudinally with serial risk factor assessment, noninvasive tests (e.g., exercise stress testing) and coronary arteriography to establish significance of given lesions and the influence of risk factor modification on disease progression. Newer noninvasive techniques used to assess the functional capacity of the coronary circulation will be correlated with the results of cardiac catheterization in an attempt to reduce the frequency of the latter procedure at no expense to flying safety and mission completion.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, STATISTICAL ANALYSIS OF STEADY-STATE COMBUSTION OF COMPOSITE SOLID PROPELLANTS
R.L. GLICK, Thiokol Chemical Corporation, *Huntsville, Alabama* (DF044910; F49620-76-C-0008)

AF function - nearly all future Air Force rocket propulsion systems will use solid propellants. Deficiency - current capabilities do not permit the prediction of steady or unsteady combustion behavior of these propellants. Objective - this research is to predict the steady and unsteady combustion characteristics through detailed computer modeling of the burning. How work contributes - when successful, this work will permit choosing accurate formulations of complete families of propellants to meet desired performance characteristics after a very few number of relatively inexpensive tests.

Recent advancements in steady-state, composite propellant combustion modeling have been made by assuming that the topography of the burning surface is a fuel plain dotted with concave and/or convex oxidizer surfaces and the macroscopic flame structure is an ensemble of non-interacting quasi-one-dimensional flames. By describing the flames in the ensemble with a modified BDP model and employing statistical concepts, a combustion model for additive free propellants with mixed, polydisperse, spheroidal oxidizer has been developed. Moreover, a strategy for including binder and oxidizer melts within the framework of the model has been developed, but not implemented. Consequently, major impediments to physically realistic modeling are believed to be associated with interacting flames, additives, nonplanar fuel surface, and interacting binder and oxidizer melts. Proposed research is directed at inclusion of melts

and interactions in the model. Melt effects will build upon past work and interactions will build Miller's approach.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0002, NUMERICAL METHODS FOR PREDICTING HIGH REYNOLDS NUMBER FLUID FLOWS

A.J. CHORIN, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (DN223123; N00014-76-C-0316)

The development of reliable procedures for solving the Navier-Stokes equations, numerically, will lead to accurate predictions of the flows about aircraft, ships and missiles, and, consequently, to much better methods for optimizing their performance. The purpose of this research is to develop techniques for solving the Navier-Stokes equations by transcending the limitations of present finite-difference and finite-element techniques which are restricted to relatively low Reynolds number flows.

This research is of an extremely exploratory nature examining, among others, gridless techniques for high Reynolds number flows. Such flows will be decomposed into a smooth flow in which concentrated vortex blobs will be imbedded. These vortex blobs are generated at solid boundaries. The flow is determined by following the dispersal of the blobs throughout the flow until convergence, in some mean sense, is reached.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

7.0003, PROBLEMS IN STABILITY ANALYSIS OF FINITE-DIFFERENCE SCHEMES FOR HYPERBOLIC SYSTEMS

M. GOLDBERG, Univ. of California, School of Arch. & Urban Plan., *Los Angeles, California* 90024 (DF044280; AF-AFOSR-3046-76)

AF function - the study of nuclear weapons effects on aerospace vehicles and ground structures. Deficiency - stable high-order accurate numerical schemes are needed for computing flow shocks, contact discontinuities and gradients. Objective - this research intends to study high-order accurate finite-difference schemes which are usable in the area of the shock and the region behind the shock. How work contributes - could eliminate the need of mixed-order accurate schemes when computing shocks.

The stability of finite-difference schemes for hyperbolic partial differential equations will be investigated. The aim is to achieve better understanding of stable computational techniques for initial value; this includes smooth problems in the quarter space, as well as Cauchy problems whose solutions contain shockwaves or other types of discontinuities. The investigations will include the particular norm properties of the generalized numerical radii, which are helpful in investigating linear stability of difference approximations in several space dimensions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0004, RESEARCH IN NUMERICAL MATHEMATICS

W.B. GRAGG, Univ. of California, Graduate School, *San Diego, California* 92037 (DF049230; F49620-77-C-0108)

AF function - the design of hardened electronic devices. Opportunity - electronic devices in aerospace vehicles may be exposed to external threats such as electromagnetic pulses (EMP) generated by nuclear devices. It is very important to determine the electric fields generated by EMP in the surface as well as in the internal parts of the vehicle. This research presents a distinct approach for computing the internal currents in bundles of wires. Objective - to continue research efforts in the area of nonlinear least squares problems. In particular, this work will seek extensions of cyclic rank one update methods developed by the proposer. How work contributes - techniques may be developed which could enhance the design of hardened electronic devices for aerospace vehicles.

This research will investigate extension of the basic theory for nonlinear least squares for the purpose of making the following extensions: (1) an asymptotically equivalent version of the cyclic rank one update previously developed, (2) extension to SOR and SSOR updating methods, (3) extension to methods based on Chebyshev semi-iteration, and (4) adaptation of the conjugate gradient method, as a generalization of (3).

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0005, SPECIALIZED ASTRONOMICAL COMPUTATIONS

P.M. JANICZEK, U.S. Navy, Observatory, *Washington, District of Columbia* 20390 (DN546025)

Prepare specialized astronomical computations to support and augment the technical/operational programs and activities of the Naval Observatory as prescribed by its Navy and Department of Defense mission of navigation and time determination.

The specialized astronomical computations are prepared in support of the work of the other divisions of the Naval Observatory, Navy programs, and Department of Defense programs. Examples are preparation of specialized astronomical data for Polaris-Poseidon missile guidance system and for Polaris submarine star tracker, special lunar position computations for use with the ballistic missile early warning system, special computations of celestial navigation for the Air Force, and development of special tables of sunrise and sunset and moonrise and moonset for tactical and/or intelligence purposes.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Observatory

7.0006, MICROWAVE PHYSICS MATH

UNKNOWN, R D P Incorporated, *Bedford, Massachusetts* 01713 (DF900200; F19628-75-C-0119)

AF function - target detection in clutter, missile reentry communications, electronic countermeasures. AWACS and Advanced Airborne National Command Post. Deficiency - electromagnetic scattering screens radar targets. Plasma sheath reflects RF signals in reentry vehicles. ICBMs and ITMBs are vulnerable to ABM interceptors. AWACS and AABNCP communications can be interrupted by jamming signals. Objective - methods of target detection in clutter and methods of radar cross-section control. Characterization of plasma sheath and effects of chemical additives. Development of contiguous wideband frequency analyzers for threat signal acquisition. Design of frequency agile anti-jam system. How research contributes - establishes target scatter characteristics with and without clutter present and contributes to the design of ABM penetration aids.

Evaluation and reduction of data derived from measurements of mathematical models will aid in the solution of problems. The completed work is in the form of graphs, curves, tabulations or equations, suitable for computer processing. These results will be incorporated in the overall research effort of the laboratory in above-mentioned problem areas.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

7.0007, AIR CUSHION VEHICLE (ACV) MATHEMATICAL MODEL DIGITAL COMPUTER PROGRAM

B. CUEVAS, Charles Stark Draper Lab. Inc., *Cambridge, Massachusetts* 02139 (DN594006; N61339-75-C-0057)

The development of a digital computer program for an ACV math model. The programmed ACV math model, a combined effort of the Draper Lab and NTEC incorporated with the CRT display system will be used for training pilots in maneuvering into a mother ship and landing on a beach.

(Sep 76 - Mar 77) The preliminary computer program report was received and reviewed. Await the corrected master copy of the report for publication.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Training Equipment Center

7.0008, MATH AND PHYSICS STUDIES

N. GROSSBARD, Boston College, Graduate School, *Chestnut Hill, Massachusetts* 02167 (DF247420; F19628-76-C-0147)

Research - upper atmospheric studies and rocket attitude determination. How research contributes - studies of high-resolution solar data. Emission intensity studies in the earth's ionosphere and determination of dynamical motion of rockets.

Using numerical analysis, Fourier methods and integral equation techniques, mathematical models will be developed to test and improve the performance of space vehicles.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

7.0009, NEW TECHNIQUES IN NUMERICAL ANALYSIS AND THEIR APPLICATION TO AEROSPACE SYSTEMS
A. MIELE, Rice University, Graduate School, *Houston, Texas* 77001 (DF033520; AF-AFOSR-3075-76)

AF function - the design of effective lightweight aerospace vehicles. Opportunity - optimization algorithms of the gradient restoration type may be useful in the design of structures with minimum weight for a given stiffness and natural frequency. Objective - this research will investigate numerical techniques in system theory and aerospace engineering of particular interest to the Air Force. How work contributes - techniques to be developed under this effort when properly implemented may be used as design tools by aerospace engineers.

The research will involve the following problem areas: (1) transformation techniques for making the SGRA and the MQA algorithms applicable to a wide variety of problems of optimal control, (2) sequential gradient-restoration algorithm with discontinuous control, (3) sequential gradient-restoration algorithm with discontinuous state, (4) interaction of linear programming and optimal control, (5) method of multiphers, (6) approximation of a continuous control with a succession of piecewise constant control, and (7) structural optimization involving statical as well as dynamical problems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0010, A WALSH FUNCTION APPROACH TO THE ESTIMATION PROBLEM 14483-M
C.F. CHEN, Univ. of Houston, School of Engineering, *Houston, Texas* 77004 (DA0F9044; DAAG29 77 G0143)

The ultimate goal of this investigation is to develop a simple on-line algorithm for estimation of dynamic response of flight vehicles encountering constant disturbance. Relevance - the research is directly relevant to trajectory estimation problems for missiles and other flight aircrafts. The successful completion of this research will benefit MIRADCOM and WSMR in considerable reduction of time and money in their flight test-programs.

The ultimate goal of this investigation is to develop a simple on-line algorithm for estimation of dynamic response of flight vehicles encountering constant disturbance.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, LOW-ENERGY ELECTRON PRECIPITATION OVER THE POLAR AURORAL AND CUSP REGIONS DURING THE IMS
K.A. ANDERSON, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (DF044460; AF-AFOSR-3072-76)

AF function - prediction of the effects of solar transient phenomena on the earth is important for the impact on Air Force communications systems. Deficiency - an effective understanding of the physical phenomena coupling the interplanetary medium with the earth's atmosphere does not exist. Objective - the unique set of data provided by the Air Force DMSP satellite systems will provide an added dimension to research in understanidng auroral phenomena. Contribution - the relatively new resource of DMSP data will lead to a better understanding of auroral phenomena and solar-terrestrial relations.

The principal investigator on this grant will use auroral photographs produced by the USAF weather satellites (DMSP). These will provide the initial capability for specifying details on the polar region ionospheric structure on a vast, almost global scale. This goal will be accomplished by applying pattern recognition techniques to the data of auroral electron and auroral scanner simultaneous observations from these satellites so that the precipitation characteristics, both spectral and intensity, in different types of auroral forms and activities will be determined. The results will enable us to infer the particle and energy precipitations as well as the structure of the polar ionosphere based on the auroral scanner data alone.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0002, COHERENT OPTICAL PHENOMENA AND SOLID-STATE SPIN RESONANCE
E.L. HAHN, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (DMR77-18310)

Analog effects known in nuclear magnetic resonance such as rotary saturation and coherent emission damping will be investigated in the optical domain where additional properties of propagation and fluorescence serve to monitor dynamical atomic transition processes. Nuclear magnetic resonance multilevel double and triple photon resonance experiments serve to enlarge the understanding of similar optical resonance experiments. A recently achieved new method for coherent phonon generation in single crystals by conversion of electron magnetic spin to phonon energy is to be extended by further refinement of pulsed electron spin resonance techniques. Nonlinear effects of self-induced transparency and picosecond pulse excitation are to be investigated with precision-controlled dye laser sources.

This is a continuation of the research previously supported under DWR7302658A02. First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0003, THEORETICAL STUDY OF NONLINEAR AND COLLECTIVE EFFECTS IN UNSTABLE PLASMAS
B.D. FRIED, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (DN524497; N00014-75-C-0476)

The objective is to carry out research on the nonlinear behavior of plasmas including phenomena associated with the ponderomotive force, Whistler ducting, and applications of new nonlinear interactions for naval applications to ballistic missile effects, atomic weapons effects, communications, and energy conversion systems. Ionization effects in plasmas are related to radio frequency communication and telemetry from surveillance and navigation satellites, plasmas associated with ballistic missile signatures, and ionosphere plasma disturbances used in high-altitude atomic weapons detection.

The approach consists of theoretical and numerical studies of nonlinear and collective phenomena in plasmas. This includes the investigation of the properties of the ponderomotive force in a magnetized plasma, formulating the problem of ion acceleration by localized high-frequency fields, constructing a self-consistent theory of Whistler ducting in narrow density channels, and a search for new effects associated with the Doppler-shifted resonance in magnetized plasmas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0004, STUDIES OF NONLINEAR PHENOMENA IN HIGH-TEMPERATURE PLASMAS
P.K. WANG, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (DF038270; AF-AFOSR-2662-74)

AF function - operation of high-altitude vehicles in a post-nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as coun-

termeasures demand the understanding of nonlinear phenomena occurring in high-temperature plasmas and specifically the interaction of electromagnetic radiation with plasmas and the resulting instabilities. Deficiency - the aforementioned information needed to design advanced equipment is not available to date. Its acquisition may be realized by a well-planned theoretical and experimental research program. Objective - this project will investigate theoretically and by computer experimentation (a) bifurcation phenomena in nonlinear plasmas, (b) parameter identification in high-temperature plasmas, (c) plasma heating by neutral injection and (d) feedback stabilization and control of high-temperature plasmas. Contribution - this work is a part of a comprehensive program of plasma research for the development of an X-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and particle beam), the development of space and ionospheric communications and the development of countermeasures.

This project will perform theoretical work and computer experiments in the areas (a) bifurcation behavior of plasmas, namely its structural behavior as a function of the change of certain critical parameters by answering the following questions: (1) in a nonlinear wave-wave interacting system what type of physical parameter variations could result in a sudden change of the system behavior, (2) how does bifurcation affect the behavior of the energy transfer between the waves?, (b) parameter identification in high temperature plasmas (1) by devising new suitable diagnostic techniques and (2) by processing the experimental data to obtain the best estimates of the plasma parameter, (c) plasma heating by neutral injection by studying the evolution of the temperature distribution with time, (d) feedback stabilization of instabilities and control of the properties of high-temperature plasmas. All the foregoing areas will be correlated and coordinated to produce a total picture for stable behavior of high-temperature plasmas.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0005, LOW-ENERGY INELASTIC ATOMIC AND MOLECULAR COLLISIONS 13400-P

E. POLLACK, Univ. of Connecticut, Graduate School, *Storrs, Connecticut* 06268 (DA0Z5578; DAAG29 76 G0130)

To study the physics of ion-atom and ion-molecule collisions with the goal of understanding atomic inner shell processes for X-ray lasers and high-power chemical lasers but not limited only to these applications. The atomic inner-shell processes (X-rays, Auger and photoelectron emission) are important for a number of materials identification, testing and evaluation programs for the Army, and X-ray laser would be useful for materials research in general, for nuclear weapons effects simulations and possibly for use as a weapon. The ion-molecule experiments have potential relevance to high-power chemical laser work at AMIC.

A. Ion/photon/electron coincidence techniques will be used to determine inner-shell X-ray and Auger yields and the effect of outer-shell configurations that increase the X-ray yields for possible X-ray laser candidates. B. By investigating energy loss spectra in ion-molecule collisions, determine separability of electronic and vibrational excitations, the role of symmetries and resulting selection rules.

SUPPORTED BY U.S. Dept. of Defense, Development & Readiness Command, Army Research Office

8.0006, LOW-ENERGY X-RAY AND ELECTRON INTERACTIONS WITHIN MATTER

B.L. HENKE, Univ. of Hawaii, Graduate School, *Honolulu, Hawaii* 96822 (DF039750; AF-AFOSR-2762-75)

AF function - this proposed research primarily falls in the 6.1 research objectives which deal with nuclear weapon effects. The research contributes to the enhancement of the capability to simulate both the X-ray and electromagnetic pulse environment, along with the development of appropriate sensors and diagnostic instrumentation for research efforts related to this subarea. The study of X-ray response is concerned ultimately with assessing the vulnerability and hardness of Air Force systems. Deficiency - existing instrumentation systems are inadequate in terms of response, survivability, accuracy, etc. Present and future methods of simulation of nuclear airblast and ground motion require the development of new measurement concepts that will meet experimental requirements. Objective - the specific objectives, which are considered to be of immediate need and importance, are: (1) the measurement, tabulation and intercomparison with recent theoretical calculations of low-energy X-ray and electron interaction coefficients, (2) the continued refinement of methods for the generation, detection and spectroscopy of these low-energy radiations, (3) the application of low-energy X-ray and electron physics and its associated instrumentation to chemical and structural analysis of surfaces, to studies of low-energy electron spectra from solids, to X-ray spectroscopic measurement of high-temperature plasmas. Contribution - this research is a part of a comprehensive program in radiation interaction with matter investigations.

Very early in this work it was considered to be of an important advantage to combine into a single research program the study of both the low-energy X-ray and the associated electron interactions. Another important aspect of the research approach has been to place an equally strong emphasis on the development of new and efficient methods of low-energy X-ray and electron spectroscopy, such as that upon measurement and application. Unlike many areas of radiation physics, in this low-energy region precision measurement is very difficult and often impossible by the conventional methods. A new type of high-power, ultrasoft X-ray source was developed as demanded for excitation in both the X-ray and the electron spectrograph system. Because this research area is still quite new and unsettled, the associated development of methods and instruments continues to be considered very important in a productive research program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0007, ELECTRONICALLY INDUCED PHASE TRANSFORMATIONS

A.J. FREEMAN, Northwestern University, School of Arts & Sciences, *Evanston, Illinois* 60201 (DF042710; AF-AFOSR-2948-76)

AF functions - this proposed research primarily falls in the 2.3 and 2.1 research objectives, which deal with electromagnetic materials and the metalworking fundamentals. Materials in use today are operating at or near their capacity as regards stress, temperature and environment. It is necessary to prolong use of current systems and to envision new ones which will have extreme reliability. The characterization of these new materials as well as understanding the fundamental properties which cause phase transformations constitute the scope of this research. Deficiency - underlying all electromagnetic materials research is the need for identification, synthesis, and complete characterization. Fundamental studies of electronically driven phase transformations such as spin density waves, charge density waves and structural phase transformations are essential in order to obtain a better understanding of the interactions responsible for the transformations. Objective - the objective will be to use novel theoretical techniques developed by the principal investigator to obtain detailed first-principle understanding of the behavior and characteristic properties of several important classes of materials (bcc to omega phase transition metals and the formation of charge density waves in transition metal di-chalcogenides). How work contributes - this research is a part of a comprehensive program to support the work in statistical mechanics studying phase transitions in materials.

The approach to be taken in this proposal is to study the electronically driven instabilities of the conduction electrons in metals by investigating the divergencies in the generalized static electronic susceptibility. These instabilities will be investigated by means of accurate calculations of the non-interacting conduction electron susceptibility using results of energy band calculations. The electronic interactions responsible for the observed electronically induced phase transformations in several important classes of materials will be investigated theoretically in close collaboration with experimental programs at other institutions. These include the bcc to omega phase transitions in the transition metals, the formation of charge density waves in transition metal

di-chalcognides and in NbO2 and VO2 and some high-temperature superconducting materials. (Text abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0008, SEMICONDUCTOR OXIDE INTERFACE STATES
C.T. SAH, Univ. of Illinois, Aviation Research Laboratory, *Savoy, Illinois* 61874 (DF042160; AF-AFOSR-2911-76)

AF function - Air Force communications, data processing, and remote sensing systems are among the many systems requiring reliable and stable solid-state electronic components and devices. Deficiency - silicon is the dominant semiconducting material used in these devices, and the surface states, interface states, and oxide traps exert a controlling influence on the reliability as well as the electrical characteristics of bipolar and MOS field effect transistors. In addition, the two- and three-dimensional electrical properties of semiconductors are becoming increasingly important as the characteristic size in devices is reduced to submicron dimensions. Objective - the objective of this research is to obtain an understanding of the atomic origins and microscopic-macroscopic properties of the interface surfaces and oxide charges on semiconductor surfaces, as well as an understanding of two- and three-dimensional effects which become important at submicron device sizes. How work contributes - the objective will be accomplished by providing a combined experimental/theoretical approach.

Studies will be continued on the interface and oxide charges located at the silicon/silicon-dioxide interface of thermally oxidized silicon. One technique to be used is that of vacuum ultraviolet excitation. Ultraviolet radiation will be used to generate electrons and holes at the oxide surface. These charges will then be moved into the oxide by means of an electric drift field. The trapping by the oxide and interface states of these electrons or holes can then be monitored by capacitance measurements. A second technique which will be used to detect traps and interface states will be that of keV electron excitation. For this technique a several kilovolt electron beam is switched on and off of a MOS capacitor while the current transients from the device are monitored. Both of these techniques will be used to observe oxide and interface states in oxidized silicon and to correlate these states with various processing parameters associated with thermal oxidation of silicon. The study of small-geometry effects will also continue. A focused electron beam with high-speed switching will be used to generate special oxide charge patterns which will simulate submicron geometry transistors. Micron-size defects will also be generated in the gate of large-area FETs in order to study the effect of small defects on device characteristics. (Text abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0009, MATERIAL SUPPORT TECHNOLOGY - ION IMPLANTATION OF GALLIUM ARSENIDE
B.G. STREETMAN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DN675519; N00014-76-C-0806)

Future Navy electronics systems will use solid-state electronics components fabricated in new semiconductor materials. The properties of these materials and their response to various device fabrication processes must be known. The process of ion implantation in gallium arsenide needs clarification if amplifiers, oscillators, and electrooptic devices are to be improved.

The properties of gallium arsenide (GaAs) implanted with various dopant impurities will be studied. Many unknowns will be investigated, such as, the effects of radiation damage induced by the ion bombardment, the processes by which the dopant atoms become electrically active in the semiconductor, the effects of various surface encapsulating films which prevent GaAs surface degradation during heat treatment, the determination of the spatial location of impurities before and after annealing (with special attention to enhanced diffusion effects), and the correlation of resultant optical and electrical properties with implantation conditions. Beryllium and sulfur impurity spatial profiles will be determined by use of mass analysis, electron spectroscopy (Auger), and glow discharge optical spectroscopy. Electrical measurements will be made on samples fabricated into device configurations. Photoluminescence measurements will be used to investigate defect and impurity centers.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0010, OPTICAL PUMPING STUDIES OF COLLISIONAL INTERACTIONS
F.A. FRANZ, Indiana University, School of Arts & Sciences, *Bloomington, Indiana* 47401 (DF026380; AF-AFOSR-2652-74)

AF function - the Air Force has a specific interest in the development of an optically pumped nuclear gyroscope, which would be ideal for strapdown systems having an extremely high dynamic range, high g capabilities, and small size. Deficiency - past efforts to develop a functioning gyro have failed because too little is known of the fundamentals involved. Objective - in this research a series of experiments is being performed in which optical pumping methods are being used to study the effect of collisional interactions in atomic vapors. Contribution - better knowledge of the fundamentals involved in collisional interactions in NMR gyros will be achieved.

Measurement of cross sections for collisional relaxation both in low and high magnetic fields are being made. The high magnetic field work in particular promises new information on the strength and character of the collisional interaction, the influence of nuclear spin, and the dependence of collisional selection rules on strength of magnetic field. The low magnetic field work gives information directly relevant to the understanding of relaxation processes in optically pumped frequency standards, masers, magnetometers and gyroscopes.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0011, MICROBUBBLE STATES IN LIQUID HELIUM USING ULTRASOUND IN THE MEGAHERTZ RANGE AND INJECTION OF EXCESS ELECTRONS
C.W. SMITH, Univ. of Maine, School of Arts & Sciences, *Orono, Maine* 04473 (DF045790; AF-AFOSR-3113-76)

AF function - this proposed research primarily falls in the 5.3 research objectives which deal with electrical power for manned and unmanned aircraft, satellites and space stations. Research is required in the generation of usable electric power from nonnuclear energy sources, distribution and conditioning of the power and the attendant material requirements. The superconducting generators and pulsed superconductive energy storage systems have the requirement that the temperature of the systems be below the critical temperature. Thus one needs to understand the heat transport and other physical properties of liquid helium. Deficiency - as an example of the reason one needs more efficient ways of keeping the systems cool, over 90 percent of the weight of a superconductive energy storage system results from the cryogenic coolant and its storage container. Objective - the objectives of this proposal are to study the nucleation, growth, stability and decay of microbubbles in liquid helium. One can significantly change (below and above the lambda point) certain thermodynamic properties as thermal conductivity, viscosity, etc., which can be probed by the microbubbles. Also understanding the nucleation and stabilization of bubbles fields has implication in the storage and handling of cryogenic liquids as well as ordinary liquids near their boiling point. Another objective is to study the dynamics of microbubbles in a sound field. Contribution - this research is a part of a comprehensive program in superfluids and superconductors.

The approach in this proposal is to study the injection of excess electrons into liquid helium by examining energy shifts and photo current shape changes of the photo response curve with temperature, ultrasonic amplitude and ultrasonic frequency. The studies will include mobility measurements as a function of temperature and ultrasound parameters. Sound on and off experiments will be used to initiate studies of the dynamics of bubble formation and decay. These studies will lead to further experiments involving cavitation and acoustic spectra. The proposed study encompasses both basic and applied aspects of processes in liquids involving charge transport, bubble nucleation, stability and decay, electron bubble formation and interaction with sound and cavitation. (Text abridged.)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0012, TOPICS IN THEORETICAL OPTICS
R. BARAKAT, Bolt Beranek & Newman Inc., *Cambridge, Massachusetts* 02138 (DF045950; F49620-77-C-0002)

AF function - increased precision in Air Force reconnaissance and detection and greater versatility in communications require advances in optical techniques. Deficiency - basic research in the area of the interaction of electromagnitic radiation and matter is needed. Objective - to carry out a program of theoretical research in the area of the interaction of electromagnetic radiation with matter. Contribution -this research will increase the base of knowledge in the area of electromagnetic radiation.

Theoretical research will be conducted in the following areas: 1) optical diffraction theory, 2) the basic physics of the quantum theory of photoelectron counting statistics, 3) the effect of random mirror defects on laser resonator performance and the diffraction theory of unstable laser resonator configurations, 4) inversion problems that arise in various areas in optical physics, 5) theory of polarization matrices for the description of polarized light propagation through liquid crystals, 6) laser speckle studies.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0013, PRODUCTION OF HIGH-DENSITY UNIFORM FLOWING PLASMAS
R.M. PATRICK, Avco Corporation, *Everett, Massachusetts* 02149 (DF029150; F44620-75-C-0025)

AF function - airborne weapon delivery and defense, surveillance, communication, advanced high-power electric lasers. Deficiency - lack of fundamental understanding of the mechanisms and processes associated with the use of diffuse electron beams in conjunction with electric fields (i.e., electron-beam sustainer (EBS) discharge) to produce stable, uniform, high-density plasma, and lack of realistic guidelines for predicting EBS high-pressure flowing gas lasers. Objectives - to understand and develop accurate theoretical and mathematical models realistically describing the phenomena associated with EB-sustainer discharges, including the mechanisms responsible for the occurrence of plasma instability. How work contributes - will provide additional understanding and realistic analytical modeling of EB-sustainer plasma discharge not now available, will aid in defining EB plasma instability discharge limits and regions of stable operation thereby contributing to the technology base required for development of EB sustainer gas lasers with improved capabilities.

This program encompasses investigations aimed at producing stable, uniform, high-density plasmas with emphasis on studying stability of the plasma produced, including connection between attachment and thermal-acoustic instability and arcing. Diffuse electron beams will produce a uniform volumetric ionization, electric fields will control the electron temperature, recombination rate, attachment rate and molecular excitation rate. Broad area electron beams will be created and injected into a discharge chamber containing a static or flowing gas. The plasma emission spectra, plasma conductivity and local electric field in the discharge will be measured. A theoretical model of the plasma based on experimental results will be formulated to describe and predict its properties, expecially regions of instability, relationship between attachment, thermal, and acoustic instability and arcing, and behavior of plasma nonuniformities and streamers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0014, AERODYNAMIC AND ELECTROMAGNETIC PROPERTIES OF PLASMAS
L. CESARI, Univ. of Michigan, School of Lit. Sci. & The Arts, *Ann Arbor, Michigan* 48104 (DF046970; AF-AFOSR-3211-77)

AF function - design of advanced aerospace vehicles. Deficiency -more critical design criteria require more exact evaluation involving additional physical effects. Objective - increased understanding of satellite environment and structure. How work contributes - by developing solution techniques for problems in shock waves in fluids and plasmas, chemical reaction and diffusion, optical resonance, nonlinear elastic deformation and buckling, etc.

At present nonlinear problems are to a large extent treated individually although subclasses of such problems, their properties and their solution techniques are being characterized. Theoretical and numerical AF relevant examples in bifurcation aspects of three-dimensional viscous fluid flow - plasma, optical, water, and atmospheric waves and shock waves - reaction diffusion systems, nonlinear elasticity and buckling, etc., chosen for their importance in the development of a general theory, will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0015, RELAXATION PHENOMENA IN OPTICALLY-PUMPED MERCURY ISOTOPES
D.S. BAYLEY, Singer Company, *Little Falls, New Jersey* 07424 (DF035170; F49620-76-C-0009)

AF function - this research is being supported in response to RN-AFAL-05-72-1, nuclear magnetic resonance gyro improvements. Deficiency - the magnetic resonance gyro has considerable potential for Air Force applications. Objective - research is directed toward determining the nature and range of magnetic interactions and the factors which can change the nature and range. Contribution - the magnetic resonance gyro will be ideal for strapdown systems having an extremely high dynamic range, high g capabilities and small size. Possible users are aircraft and missile weapons systems.

This research involves an experimental and theoretical investigation of the sources of noise and drift in an NMR controlled oscillator and an experimental investigation of the fundamental interactions between population distribution over the magnetic sublevels.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0016, NONLINEAR PROCESSES IN PLASMAS
R.M. KULSRUD, Princeton University, School of Engin. & Appl. Sci., *Princeton, New Jersey* 08540 (DF040390; F44620-75-C-0037)

AF function - operation of high-altitude vehicles in a post-nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as countermeasures demand the fundamental understanding of nonlinear evolution of energy transformations in plasmas. Deficiency - the aforementioned information required for the design of advanced equipment is not available today. Its acquisition may be realized by a well-planned theoretical and experimental research program. Objective - this program will investigate nonlinear collective phenomena, such as anomalous transport phenomena, linear wave absorption, and plasma wave turbulence, both in the laboratory and in space. Contribution - this work is a part of a comprehensive program of plasma research for the development of an X-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and particle beam), the development of space and ionospheric communications, and the development of countermeasures.

This project will perform theoretical calculations, analyze, evaluate and correlate the available experimental results of laser plasma interactions, solar wind plasmas, ionospheric plasmas, acceleration processes and runaway electron plasmas. Specifically it will investigate (a) the problem when 'islands' in plasmas appear in two forms, either as magnetic 'islands' in configuration space, or as 'islands' of near resonance in phase space. The islands may be sporadic but their presence causes rapid diffusion, (b) the nonlinear evolution of the tearing instability made with specific reference to the development of magnetic island structures and to move violent processes such as disruptive instabilities and rapid magnetic reconnection, (c) various types of solitary wave structures which develop in the very large amplitude turbulence associated with rapid heating methods in laser interactions, (d) it will also develop numerical techniques for elucidating the properties of runaway electron discharges and the instabilities observed in laboratory situations and (e) it will continue the study of electron density striations in the ionosphere and their relation to communication problems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0017, THEORETICAL STUDIES IN NUCLEAR AND PARTICLE SCATTERING
K.L. KOWALSKI, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106 (PHY77-25280)

A theoretical investigation of several areas of nuclear and particle scattering is proposed. Areas to be studied include: 1) Multiparticle Scattering. Investigation of nonrelativistic N-particle scattering theories and approximation methods; special projects in three-particle scattering including three-body models of nuclear reactions and relativistic systems. 2) Studies in Medium Energy Theory. Several investigations in pion-nucleus scattering; studies of nucleon-nucleus scattering, formal scattering theories, and reaction theories involving complex projectiles. 3) Development of New Methods in the Theory of Nuclear Reactions. Formal and calculational investigation having the goal of developing theoretical tools for dealing with the complex many-body aspects of nuclear reactions including elastic scattering, transfer reactions, and radioactive decay; study of the application of scattering theory methods to bound state problems.

This work is a continuation of that currently initiated under NSF grant PHY74-02239 A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0018, TRANSPORT, THERMAL AND MAGNETIC PROPERTIES OF SOLIDS
J.A. RAYNE, Carnegie Mellon University, Inst. of Technology, *Pittsburgh, Pennsylvania* 15213 (DMR76-80939 A01)

Research into the transport, thermal and magnetic properties of solids will be continued. The nature of amorphous metal alloys will be investigated by means of ultrasonic attenuation and velocity experiments, as well as by low-temperature heat capacity and transport measurements.

A study of the critical behavior of low-dimensional magnetic insulators also will be made using ultrasonic techniques. These techniques will also be applied to further investigations into the electronic scattering rate and the shear wave attenuation in transition metals. Collaborative studies on the magnetic properties of ternary palladium-silver-iron system, particularly in the spin-glass regime, will be undertaken by magnetoresistance and Mossbauer measurements.

This is a continuation of research supported under DMR73-07498.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SPECTROPOLARIMETRY OF LATE-TYPE VARIABLE STARS
G.V. COYNE, Univ. of Arizona, Lunar & Planetary Laboratory, *Tucson, Arizona* 85721 (INT77-20882)

In this award NSF provides funds to permit Dr. George Coyne of the Lunar and Planetary Observatory of the University of Arizona to carry on a cooperative research program with Drs. Antonio M. Magalhaes and Sayd J. Codina of the Institute of Astronomy and Geophysics of the University of Sao Paulo, Brazil.

Their work on Spectropolarimetry of Late-Type Variable Stars is part of a larger effort for the exploration of the properties of the atmospheres of these pulsating stars. This work on narrow band spectropolarimetry should provide some of the missing information on the atmospheres of long-period variable stars. The large number of these stars indicates their importance in the process of stellar evolution.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

10.0002, SOLAR OSCILLATIONS
H.A. HILL, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (DF248760; F19628-77-C-0064)

AF function - communications, surveillance, detection, tracking. Deficiency - extremely limited knowledge of solar interior structure. Objective - determine the nature of possible solar oscillations and construct solar interior models based on these results. How research contributes - a detailed knowledge of solar interior structure is needed before accurate models capable of predicting the behavior of solar magnetic fields may be constructed.

Continue observations of solar oscillations with periods between ten and fifty minutes. Based on the derived amplitudes and frequencies of these oscillations solar interior models will be constructed. These models can then be used to investigate the origin of solar magnetic fields.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

10.0003, MODELING OF PLANETARY ATMOSPHERES
M.G. TOMASKO, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (AST77-09489)

With previous support, progress has been made in analyzing Pioneer 10 photometry of Jupiter in red and blue light at seven phase angles from 12 degrees to 150 degrees. This work indicated the presence and scattering properties of high-altitude haze on Jupiter, yielded the form of the single scattering phase function of Jupiter's clouds, and constrained the spherical albedo and thus the size of Jupiter's internal heat source. In the second year, the photometric analysis will be expanded to include Pioneer 11 data for the purpose of filling a sizeable gap in the phase angle coverage, and the Pioneer polarization data will be compared with the vertical cloud structures derived from the photometric studies to give additional information on the distribution and single-scattering properties of the Jovian aerosols. Finally, ground-based limb darkening scans of Jupiter will be obtained in several absorption bands and continuum regions for analysis in order to constrain further the vertical structure of the Jovian clouds.

Prior support was NSF grant AST 76-06809.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, SPECTROSCOPIC OBSERVATIONS OF QUASARS
M. SCHMIDT, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (AST77-22615)

The following research programs will be carried out: 1) A continuing search for, and measurement of the spectroscopic studies of bright quasars, 2) The obtaining of spectra and redshifts of faint quasars, 3) A study of the optical continuum of quasars, and 4) Other incidental studies of radio quasars. The studies of bright and faint quasars will yield information on the exact shape of the very steep decrease of quasar space density with cosmic time. The study of the optical continuum, which already has uncovered a wavelike deviation from a power law, may lead to improved understanding of the radiation mechanism at work in the generation of the extraordinary luminosity exhibited by quasars. Spectroscopic studies of radio quasars are designed to improve our knowledge of the radio luminosity function of quasars.

This is a continuation of research done under grant AST 75-22923 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, EXTERNAL GALAXIES AND QUASI-STELLAR OBJECTS
E.M. BURBIDGE, Univ. of California, Graduate School, *San Diego, California* 92037 (AST77-22560)

A combined observational and theoretical program of research on problems of the physics of quasars and related extragalactic objects will be carried out using the 3-m and 4-m telescopes at Lick, Kitt Peak, and Cerro Tololo Interamerican Observatories. Quasars are generators of very large amounts of energy, by processes still little understood. Their relationship to

the active centers of galaxies--radio galaxies, Seyferts, etc., and their role in the evolutionary history of galaxies and universe, are parts of the puzzle which they present. The problem of the source of their large outpourings of energy from very small volumes, and their possible connection with states of matter (gravitationally collapsed matter, black holes, etc.) unattainable on earth, make these objects interesting to physicists as well as astronomers, and also of general popular interest.

Particular attention will be devoted to quasars with very large redshifts which may be the most distant visible objects in the universe. Identification work and redshift measurements for very faint radio galaxies will also be carried out, to help map the expansion of the universe and its evolutionary history.

The research is timely now, with the prospect of new research in these fields being expanded by the Space Telescope and other Shuttle-related space experiments.

This is a continuation of research done under AST 74-19471.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, HIGH-ENERGY PHONON SPECTROSCOPY USING TUNABLE DYE LASERS
J.E. RIVES, Univ. of Georgia, School of Arts & Sciences, *Athens, Georgia* 30602

SUPPORTED BY Research Corp.

10.0007, X-RAY BALLOON OBSERVATIONS FROM THE NORTHERN AND SOUTHERN HEMISPHERES
W.H. LEWIN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (AST76-06133 A01)

High-energy X-ray observations of galactic and extragalactic objects (approximately 18-150 KeV) will be conducted at an unprecedented level of sensitivity. Objects down to a flux level ten times weaker than the weakest sources observed by the Uhuru satellite will be observed. For bright sources, the system will be 'photon-limited' in sensitivity to burst or flare-like changes in source intensities. Consequently, for the 3000 cm2 system changes on characteristic time scales 4 to 5 times shorter than has been previously possible in hard X-rays will be detected (or, equivalently, for a given characteristic time changes 4 to 5 times smaller will be detected).

Briefly, some of the observational objectives are: Compact extragalactic objects (such as Cen A, 3C 273, NGC 4151, 3C 390.3, and others); Virgo cluster (M87); Globular clusters (NGC 6624 and NGC 6441); X-ray pulsars (NP 0532 and PSR 0833-45), including measurements of variability in the light curves of NP 0532; unidentified high-galactic latitude sources; X-ray binaries during periods of eclipse edges; measurements of periodicities and variabilities of the light curves of known and unknown pulsating X-ray objects such as: 3U 0900-40, SMC X-1, Her X-1, and others down to a time resolution of 1 msec; measurements of variability (periodic and non-periodic) of several known bright hard X-ray sources (Cyg X-1, Gx 301-2, GX 1 plus 4, Cyg X minus 3) down to a time resolution of 1 msec.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, SUNSPOTS
J.H. THOMAS, Univ. of Rochester, School of Engin. & Appl. Sci., *Rochester, New York* 14627 (DF249000; F19628-77-C-0079)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Objective -determine quantitative structure and dynamics of magnetic fields in solar sunspot regions. How research contributes - knowledge of solar magnetic field behavior is necessary to understand the role fields play in flare production.

Apply theoretical magnetohydrodynamics to observed motions and field configurations in sunspot umbrae and penumbrae. Such research will provide an insight into the physics of magnetic fields in spots and their impact on adjacent solar flare producing plage regions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

10.0009, EMPIRICAL DETERMINATION OF THE CEPHEID AND RR LYRAE DISTANCE SCALES (ABBREV)
T.G. BARNES, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (AST76-21316 A01)

A new method will be used to calibrate the classical Cepheid distance scale and the period-luminosity relation. Simultaneous photometric and spectroscopic observations will be made of these variable stars. The photometry will be used to determine the variation in angular diameter with phase. The spectroscopic and photometric measurements will be used to give the distance and the mean linear radius of each variable. A similar program will be carried out on the RR-Lyrae variable stars.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

GENERAL

11.0001, TECHNOLOGY TRANSFER FROM FLIGHT INDUSTRIES TO THE GENERAL ECONOMY
P.A. HANLE, Smithsonian Institution, *Washington, District of Columbia* 20560

The goal of this work by three authors is to document in case histories how engineers and their sponsors applied aerospace methods to five complex problems on earth. The cases range from the development of liquified natural gas tankers to the reform of some of California's public services. They include in addition the construction of a 'people mover' in Morgantown, West Virginia; the use of mathematical modeling to simulate the flow of securities; and the use of a technique called 'Delphi' for collecting expert opinions and including a sort of consensus. The focal point of each study lay in analyzing the forces at play in developing a complex system, and all cases are introduced by the editor, as is the volume as a whole. The book is in final draft and is in concluding stages of retyping. It has been submitted for review for possible publication by the SI Press or Cornell Press.

SUPPORTED BY Smithsonian Institution, National Air & Space Museum

11.0002, DEVELOPMENT OF MAP PRODUCTS ON STATE OF RANGELANDS
N. WHITEHORN, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NAS 9-15468)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N78-20049* + National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 93, FEBRUARY 1978
Feb. 1978 101 p refs
(NASA-SP-7037(93)) Avail: NTIS HC E02(special price) CSCL 01A

This bibliography lists 339 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1978. Author

N78-20050*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUMMARY OF NASA LANDING GEAR RESEARCH
Bruce D. Fisher, Robert K. Sleeper, and Sandy M. Stubbs Mar. 1978 34 p refs
(NASA-TM-78679) Avail: NTIS HC A03/MF A01 CSCL 01C

The landing gear is summarized. Research relative to tire tread, powered wheel taxiing, air cushion landing systems, and crosswind landing gear is discussed in some detail. An airplane ground-handling simulator was developed to provide a research tool for investigating, in perfect safety, directional control and braking problems of airplanes on slippery runways in the presence of crosswinds. One example of its application is to explore airplane control problems during high speed turnoffs from main runways onto taxiways. The simulation development was performed in a visual-motion simulator. A discussion of some of the significant developments is presented. Author

N78-20051*# Operations Research, Inc., Silver Spring, Md.
AVIATION SYSTEM MODELING STUDY AND ALTERNATIVES Final Report
7 Oct. 1975 10 p
(Contract NAS5-24033)
(NASA-CR-156715) Avail: NTIS HC A02/MF A01 CSCL 01B

The Aviation System Modeling Study was directed toward two primary goals: an improved understanding of the U.S. aviation system, and technology. There are three major categories into which the individual study efforts may be subdivided. These three categories are: special issue studies, task studies, and data base development. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N78-20052 Engineering Sciences Data Unit, London (England).
SUBSONIC PRESSURE DRAG OF CONICAL BOAT-TAILS
Sep. 1977 7 p
(ESDU-77020; ISBN-0-85679-191-1) For information on availability of series, sub-series and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $146.50

A method for estimating the zero incidence boat-tail pressure drag was provided for bodies of revolution with conical boattails when there is not jet flow through the base of the body and the boundary layer is fully turbulent. The methods are typically of use in calculating the pressure drag of coasting missiles. Author

N78-20053 Arizona Univ., Tucson.
ADDITIVE DRAG OF TWO-DIMENSIONAL INLETS Ph.D. Thesis
Robert Baldwin Hall 1977 156 p
Avail: Univ. Microfilms Order No. 77-32260

The spillage from the sides of a two-dimensional inlet is treated by the method of homogeneous conical flows. This method is described and extended to determine the three-dimensional perturbation velocities within the conical flowfield. A computer program, written to determine the shape of the streamtube captured by the inlet, not only traces the streamlines, but also numerically integrates the pressures over the streamtubes to calculate the additive drag with sidespillage. The computer program was applied to several inlet designs. Comparisons of spillage are made with experimental data. The effects of various inlet variables including ramp angle, Mach number, presence of sidewalls, and leading edge sweepback are considered. Dissert. Abstr.

N78-20054 Washington Univ., St. Louis, Mo.
A STUDY OF GAMMA EFFECTS ON TWO-DIMENSIONAL TRANSONIC AERODYNAMICS Ph.D. Thesis
John Chi-Kwong Wai 1977 134 p
Avail: Univ. Microfilms Order No. 7800982

Shock boundary-layer interactions initiated by compression corners were observed in Freon-12, carbon dioxide, nitrogen and argon at nominal Mach numbers of 1.40 and 2.00. High quality test flow was generated with the use of screen nozzle plates in a Ludwieg-tube-driven test section, and holographic interferometry was used as the primary diagnostic. Incipient separation occurs at smaller compression angles in test gases with larger density. Shock-induced turbulent boundary-layer separation was modeled and analyzed. A modified form of the Stratford-Townsend separation criteria has been developed for compressible flow application. Correlations with the separated flow experiments were found to be satisfactory. Dissert. Abstr.

N78-20055 Virginia Univ., Charlottesville.
RESONANT BEHAVIOR OF A SYMMETRIC MISSILE HAVING ROLL ORIENTATION-DEPENDENT AERODYNAMICS Ph.D. Thesis
Thomas Russell Pepitone 1977 179 p
Avail: Univ. Microfilms Order No. 78-00425

The transient response of a symmetric, cruciform missile, having roll orientation-dependent aerodynamics, is studied. In

the case of missile planar motion an asymptotic method was used to investigate the parametric resonance instability which exists at one-half the fundamental resonance roll rate. Two degree-of-freedom motion, with constrained center of gravity, was investigated using the method of averaging. Approximate solutions are generated at the roll frequencies corresponding to fundamental, parametric, and subharmonic resonance. Application of plane autonomous system theory reveals stability boundaries as well as the critical dependence on initial conditions. An aerodynamic force and moment expansion, consistent with reflectional and rotational symmetry arguments, is incorporated into the equations of motion, and an approximate solution which is valid for arbitrary spin is generated. Dissert. Abstr.

N78-20056 Tennessee Univ., Knoxville.
AN ANALYSIS OF TRANSONIC VISCOUS/INVISCID INTERACTIONS ON AXISYMMETRIC BODIES WITH SOLID STINGS OR REAL PLUMES Ph.D. Thesis
Steven F. Yaros 1977 178 p
Avail: Univ. Microfilms Order No. 78-02050

Pressure distribution predictions over arbitrary bodies of revolution in transonic flow were numerically and theoretically analyzed. Previous and contemporary efforts in this direction are reviewed and a combined viscous/inviscid digital computer program which was developed to iterate between the inviscid transonic and the viscous portions of the analysis is described. For attached boundary layers the calculation procedure was fully automated for both subcritical and supercritical cases, and predicted pressure distribution agree well with data. The entrainment effect of a real plume was modeled using the mixing theory first developed by Chapman and Korst. This method shows promise when its results are compared with data, but further work must be done to more correctly model the turbulent mixing of the two jets. Dissert. Abstr.

N78-20057 Princeton Univ., N. J.
ACTIVE FEEDBACK CONTROL OF AN ELASTIC BODY SUBJECTED TO A NONCONSERVATIVE FORCE Ph.D. Thesis
Hidetsugu Horikawa 1977 211 p
Avail: Univ. Microfilms Order No. 7800265

The converging frequency flutter instability which occurs in a thin cantilevered beam subjected to a nonconservative follower force was studied to determine the fundamental aspects of stabilization of wing flutter by feedback control. A modal approach was used to obtain the mathematical model and control techniques and carried out to the validity of the theoretical model was verified. Good correlation was shown between theoretically and experimentally determined stability boundaries as well as modal frequency and damping variation with follower force. The application of linear control theory to simple analytical models is discussed. A standard root locus technique is used to understand and explain the control of the beam as well as wings undergoing bending-torsion flutter. Dissert. Abstr.

N78-20058 Illinois Inst. of Tech., Chicago.
AN EXPERIMENTAL INVESTIGATION OF OSCILLATING FLOWS OVER AN AIRFOIL Ph.D. Thesis
Lakshmendra Shanker Saxena 1977 225 p
Avail: Univ. Microfilms Order No. 7800881

The basic features of unsteady flow fields generated by sinusoidally oscillating airstreams over a stationary airfoil at fixed angles of attack close to the angle of static stall were studied with focus on the dynamic stall of helicopter rotors. Hot-wire surveys of the velocity field above the airfoil (NACA 0012 profile) and surface pressure measurements around the airfoil were used with data from heated surface film gages and flow visualization achieved through silk tufts. Reduced frequencies of 0.18 and 0.9 were used at amplitude ratios of 0.18 and Reynolds number of 250,000. Periodic sampling and averaging techniques were used to obtain instantaneous boundary layer and wake mean velocity profiles and pressure coefficient distributions at different instants of the freestream oscillation cycle. Dissert. Abstr.

N78-20059 California Inst. of Tech., Pasadena.
TOPICS IN VORTEX MOTION Ph.D. Thesis
John Steven Sheffield 1978 164 p
Avail: Univ. Microfilms Order No. 7732573

The stability of the unsteady flow field due to the vortex filament expanding under the influence of an axial compression is examined as a possible model of the vortex bursting observed in aircraft contrails. The stability of a steady vortex filament deformed by two-dimensional strain and shear flows, respectively, is studied. Exact solutions are constructed for two-dimensional potential flow over a wing with a free ideal vortex standing over the wing. Disturbances which deform the filament centerline into a wave which does not propagate along the filament are shown to be unstable and a method is described to calculate the wave number and corresponding growth rate of the amplified waves for a general distribution of vorticity in the vortex core. The stability of the shapes to two-dimensional, periodic and symmetric disturbances is considered for hollow vortices. Dissert. Abstr.

N78-20060+ Societe Bertin et Cie, Villeurbanne (France).
AERODYNAMIC FLUID-FIBER INTERACTIONS Final Report [ETUDE DES INTERACTIONS AERODYNAMIQUES FLUIDE-FIL]
B. Biot and G. Lovat Apr. 1977 118 p refs In FRENCH
(Contract DGRST-74-7-0695)
(NT-77-CN-1) Avail: NTIS HC A06

The aerodynamic friction of textile fibers in a parallel uniform flow was studied at speeds up to 150 m/s. The flow turbulence has a negligible influence on smooth fibers and an appreciable influence on textured fibers. The confinement of the flow in a tube modifies the laws obtained for infinite vanes. In the case of smooth fibers, the tube tends to impose on the fiber the evolution of the friction law as a function of the Reynolds law. For textured fibers the friction augments with the confinement. Translational motion of the fiber leads to an increase of the friction coefficient. ESA

N78-20061*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC ROLL DAMPING OF A MODEL WITH SWEPT-BACK AND SWEPT-FORWARD WINGS
Richmond P. Boyden Mar. 1978 36 p refs
(NASA-TM-78677) Avail: NTIS HC A03/MF A01 CSCL 01A

The aerodynamic roll damping and the yawing moment due to roll rate characteristics were investigated at subsonic speeds for a model with either sweptback or swept forward wings. The tests were made in the Langley high speed 7 by 10 foot tunnel for Mach numbers between 0.3 and 0.7. The configuration with a 60 deg sweptback wing had positive damping in roll up to the maximum test angle of attack of almost 20 deg. The 32 deg swept forward wing configuration had positive damping in roll at the lower angles of attack, but there was a decrease in damping and negative damping in roll was measured at the highest angles of attack. Author

N78-20062*# Boeing Co., Seattle, Wash.
POSSIBILITIES FOR DRAG REDUCTION BY BOUNDARY LAYER CONTROL
Irven Naiman 25 Apr. 1946 30 p refs Sponsored by NASA
(NASA-CR-145337; D-7625) Avail: NTIS HC A03/MF A01 CSCL 01A

The mechanics of laminar boundary layer transition are reviewed. Drag possibilities for boundary layer control are analyzed using assumed conditions of transition Reynolds number, inlet loss, number of slots, blower efficiency, and duct losses. Although the results of such analysis are highly favorable, those obtained by experimental investigations yield conflicting results, showing only small gains, and sometimes losses. Reduction of this data indicates that there is a lower limit to the quantity of air which must be removed at the slot in order to stabilize the laminar flow. The removal of insufficient air permits transition to occur while the removal of excessive amounts of air results in high power costs, with a net drag increases. With the estimated value of flow coefficient and duct losses equal to half the dynamic pressure, drag reductions of 50% may be obtained; with twice this flow coefficient, the drag saving is reduced to 25%. Author

N78-20063*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF WINGLETS ON A FIRST-GENERATION JET TRANSPORT WING. 3: PRESSURE AND SPANWISE LOAD

DISTRIBUTIONS FOR A SEMISPAN MODEL AT MACH 0.30

Lawrence C. Montoya, Peter F. Jacobs, and Stuart G. Flechner Washington Jun. 1977 102 p refs Prepared in cooperation with NASA. Dryden Flight Res. Center
(NASA-TN-D-8478; L-11370) Avail: NTIS HC A06/MF A01 CSCL 01A

Pressure and spanwise load distributions on a first-generation jet transport semispan model at a Mach number of 0.30 are given for the basic wing and for configurations with an upper winglet only, upper and lower winglets, and a simple wing-tip extension. To simulate second-segment-climb lift conditions, leading- and/or trailing-edge flaps were added to some configurations. Author

N78-20064*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECT OF WINGLETS ON A FIRST-GENERATION JET TRANSPORT WING. 1: LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A SEMISPAN MODEL AT SUBSONIC SPEEDS

Peter F. Jacobs, Stuart G. Flechner, and Lawrence C. Montoya Washington Jun. 1977 50 p refs Prepared in cooperation with NASA. Dryden Flight Res. Center
(NASA-TN-D-8473; L-11354) Avail: NTIS HC A03/MF A01 CSCL 01A

The effects of winglets and a simple wing-tip extension on the aerodynamic forces and moments and the flow-field cross flow velocity vectors behind the wing tip of a first generation jet transport wing were investigated in the Langley 8-foot transonic pressure tunnel using a semi-span model. The test was conducted at Mach numbers of 0.30, 0.70, 0.75, 0.78, and 0.80. At a Mach number of 0.30, the configurations were tested with combinations of leading- and trailing-edge flaps. Author

N78-20065*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECT OF WINGLETS ON A FIRST-GENERATION JET TRANSPORT WING. 2: PRESSURE AND SPANWISE LOAD DISTRIBUTIONS FOR A SEMISPAN MODEL AT HIGH SUBSONIC SPEEDS

Lawrence C. Montoya, Stuart G. Flechner, and Peter F. Jacobs Washington Jul. 1977 211 p refs Prepared in cooperation with NASA. Dryden Flight Res. Center
(NASA-TN-D-8474; L-11026) Avail: NTIS HC A10/MF A01 CSCL 01A

Pressure and spanwise load distributions on a first-generation jet transport semispan model at high subsonic speeds are presented for the basic wing and for configurations with an upper winglet only, upper and lower winglets, and a simple wing-tip extension. Selected data are discussed to show the general trends and effects of the various configurations. Author

N78-20066*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.

THE ANALYSIS OF A NONSIMILAR LAMINAR BOUNDARY LAYER

Dennis D. Stalmach and John J. Bertin Feb. 1978 121 p refs
(Contract NAS9-13680)
(NASA-CR-151658; Rept-78001) Avail: NTIS HC A06/MF A01 CSCL 01A

A computer code is described which yields accurate solutions for a broad range of laminar, nonsimilar boundary layers, providing the inviscid flow field is known. The boundary layer may be subject to mass injection for perfect-gas, nonreacting flows. If no mass injection is present, the code can be used with either perfect-gas or real-gas thermodynamic models. Solutions, ranging from two-dimensional similarity solutions to solutions for the boundary layer on the Space Shuttle Orbiter during reentry conditions, have been obtained with the code. Comparisons of these solutions, and others, with solutions presented in the literature, and with solutions obtained from other codes, demonstrate the accuracy of the present code. Author

N78-20067*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.

UNSTEADY LOADS DUE TO PROPULSIVE LIFT CONFIGURATIONS. PART A INVESTIGATION OF SCALING LAWS Final Report

Jeffrey B. Morton and John K. Haviland Mar. 1978 57 p refs
(Grant NGR-47-005-219-03)
(NASA-CR-156120; UVA/528095/MAE78/115-Pt-A) Avail: NTIS HC A04/MF A01 CSCL 01A

This study covered scaling laws, and pressure measurements made to determine details of the large scale jet structure and to verify scaling laws by direct comparison. The basis of comparison was a test facility at NASA Langley in which a JT-15D exhausted over a boilerplater airfoil surface to reproduce upper surface blowing conditions. A quarter scale model was built of this facility, using cold jets. A comparison between full scale and model pressure coefficient spectra, presented as functions of Strouhal numbers, showed fair agreement, however, a shift of spectral peaks was noted. This was not believed to be due to Mach number or Reynolds number effects, but did appear to be traceable to discrepancies in jet temperatures. A correction for jet temperature was then tried, similar to one used for far field noise prediction. This was found to correct the spectral peak discrepancy. Author

N78-20068*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.

UNSTEADY LOADS DUE TO PROPULSIVE LIFT CONFIGURATIONS. PART B: PRESSURE AND VELOCITY MEASUREMENTS IN A THREE DIMENSIONAL WALL JET Final Report

G. D. Catalano, J. B. Morton, and R. R. Humphris Mar. 1978 34 p refs Sponsored in part by NSF
(Grant NGR-47-005-219-03)
(NASA-CR-156121; UVA/526033/MAE78/101-Pt-B; UVA/528095/MAE78/115-Pt-B) Avail: NTIS HC A03/MF A01 CSCL 01A

The effects of increasing the velocity ratio, lambda sub j were explored. The quantities measured include the width of the mixing region, the mean velocity field, turbulent intensities and time scales. In addition, wall and static pressure velocity correlations and coherences are presented. The velocity measurements were made using a laser Doppler velocimeter with a phase locked loop processor. The fluctuating pressures were monitored using condenser type microphones. Author

N78-20069*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.

UNSTEADY LOADS DUE TO PROPULSIVE LIFT CONFIGURATIONS. PART C: DEVELOPMENT OF EXPERIMENTAL TECHNIQUES FOR INVESTIGATION OF UNSTEADY PRESSURES BEHIND A COLD MODEL JET

J. K. Haviland and James C. Schroeder Mar. 1978 147 p refs
(Grant NGR-47-005-219-03)
(NASA-CR-156122; UVA/528095/MAE78/113-Pt-C) Avail: NTIS HC A07/MF A01 CSCL 01A

As part of an overall study of the scaling laws for the fluctuating pressures induced on the wings and flaps of STOL aircraft by jet engine impingement, an experimental investigation was made of the near field fluctuating pressures behind a cold circular jet, both when it was free and when it was impinging on a flat plate. Miniature static pressure probes were developed for measurements in the free jet and on the flat plate which were connected by plastic tubing to 1/8 inch microphones and acted as pressure transducers. Using a digital correlator together with an FFT program on the CDC 6400 computer, spectral densities, relative amplitudes, phase lags, and coherences were also obtained for the signals from pairs of these probes, and were used to calibrate these probes directly against microphones. This system of instrumentation was employed to obtain single point rms and third octave surveys of the static pressures in the free jet and on the surface of the plate. Author

N78-20070*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.

UNSTEADY LOADS DUE TO PROPULSIVE LIFT CONFIGURATIONS. PART C: DEVELOPMENT OF EXPERIMENTAL IMENTAL FACILITY FOR THE INVESTIGATION OF SCALING EFFECTS ON PROPULSIVE LIFT CONFIGURATIONS

J. K. Haviland and William W. Herling Mar. 1978 112 p refs
(Grant NGR-47-005-219-03)
(NASA-CR-156123; UVA/528095/MAE78/114-Pt-D) Avail: NTIS HC A06/MF A01 CSCL 01A

The design and construction of an experimental facility for the investigation of scaling effects in propulsive lift configurations are described. The facility was modeled after an existing full size NASA facility which consisted of a coaxial turbofan jet engine with a rectangular nozzle in a blown surface configuration. The flow field of the model facility was examined with and without a simulated wing surface in place at several locations downstream of the nozzle exit plane. Emphasis was placed on obtaining pressure measurements which were made with static probes and surface pressure ports connected via plastic tubing to condenser microphones for fluctuating measurements. Several pressure spectra were compared with those obtained from the NASA facility, and were used in a preliminary evaluation of scaling laws. Author

N78-20071*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC LONGITUDINAL AND LATERAL-DIRECTIONAL STATIC AERODYNAMIC CHARACTERISTICS OF A GENERAL RESEARCH FIGHTER CONFIGURATION EMPLOYING A JET SHEET VORTEX GENERATOR
Jarrett K. Huffman, Charles H. Fox, Jr., and Henry Ziegler (Northrup Corp.) Jan. 1978 189 p refs
(NASA-TM-74049) Avail: NTIS HC A09/MF A01 CSCL 01A

A configuration concept for developing vortex lift, which replaces the physical wing strake with a jet sheet generated fluid strake, was investigated on a general research fighter model. The vertical and horizontal location of the jet sheet with respect to the wing leading edge was studied over a momentum coefficient range from 0 to 0.24 in the Langley 7- by 10-foot high speed tunnel over a Mach number range from 0.3 to 0.8. The angle of attack range studied was from -2 to 30 deg at sideslip angles of 0, -5, and 5 deg. Test data are presented without analysis. Author

N78-20072*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC STATIC AND DYNAMIC STABILITY CHARACTERISTICS OF A FINNED PROJECTILE CONFIGURATION
Richmond P. Boyden, Cuyler W. Brooks, Jr., and Edwin E. Davenport Apr. 1978 84 p refs
(NASA-TM-74058; L-11966) Avail: NTIS HC A05/MF A01 CSCL 01A

Static and dynamic stability tests were made of a finned projectile configuration with the aft-mounted fins arranged in a cruciform pattern. The tests were made at free stream Mach numbers of 0.7, 0.9, 1.1, and 1.2 in the Langley 8-foot transonic pressure tunnel. Some of the parameters measured during the tests were lift, drag, pitching moment, pitch damping, and roll damping. Configurations tested included the body with undeflected fins, the body with various fin deflections for control, and the body with fins removed. Theoretical estimates of the stability derivatives were made for the fins on configuration. Author

N78-20073*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC LONGITUDINAL AND LATERAL-DIRECTIONAL STATIC AERODYNAMIC CHARACTERISTICS FOR A MODEL WITH SWEPT BACK AND SWEPT FORWARD WINGS
Jarrett K. Huffman and Charles H. Fox, Jr. Feb. 1978 43 p refs
(NASA-TM-74093) Avail: NTIS HC A03/MF A01 CSCL 01A

A general research fighter model was tested in the Langley 7- by 10-foot high speed tunnel at a Mach number of 0.3. With a conventional empennage, the model was tested with the wing in a 60 deg swept back configuration and in a 32 deg swept forward configuration. The 32 deg swept forward configuration was also tested with a strake. Very limited data was obtained with a wing in a 50 deg swept back configuration and a 7 deg swept forward configuration. The angle of attack range was from approximately -4 deg to 48 deg at sideslip angles of 0 deg, -5 deg, and 5 deg. Author

N78-20074*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ONSET OF CONDENSATION EFFECTS WITH A NACA 0012-64 AIRFOIL TESTED IN THE LANGLEY 0.3-METER CRYOGENIC TUNNEL
Robert M. Hall Mar. 1978 84 p refs
(NASA-TM-78666) Avail: NTIS HC A05/MF A01 CSCL 01A

A 0.137m airfoil was tested in a 0.3m transonic cryogenic tunnel at free stream Mach numbers of 0.75, 0.85, and 0.95 over a total pressure range from 1.2 to 5.0 atmospheres. The onset of condensation effects were found to correlate more with the amount of supercooling in the free stream than it did with the supercooling in the region of maximum local Mach number over the airfoil. Effects in the pressure distribution over the airfoil were generally seen to appear over its entire length at nearly the same total temperature. Both observations suggest the possibility of heterogeneous nucleation occurring in the free stream. The potential operational benefits of the supercooling realized are presented in terms of increased Reynolds number capability at a given tunnel total pressure, reduced drive fan power if Reynolds number is held constant, and reduced liquid nitrogen consumption if Reynolds number is again constant. Depending on total pressure and free stream Mach number, these three benefits are found to respectively vary from 7 to 19%, 11 to 25%, and 9 to 20%. Author

N78-20075*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THEORETICAL ANALYSIS OF AERODYNAMIC CHARACTERISTICS OF TWO HELICOPTER ROTOR AIRFOILS
Charles E. K. Morris, Jr. and William T. Yeager, Jr. (USARTL, Hampton, Va.) Mar. 1978 29 p refs
(NASA-TM-78680) Avail: NTIS HC A03/MF A01 CSCL 01A

An analytical study was conducted to predict the aerodynamic characteristics of two helicopter rotor airfoils. Documentation of the predictive process covers the development of empirical factors used in conjunction with computer programs for airfoil analysis. Tables of lift, drag, and pitching-moment coefficient for each airfoil were prepared for two dimensional, steady flow conditions at Mach numbers from 0.3 to 0.9 and Reynolds numbers of 7,700,000 to 23,000,000, respectively. Author

N78-20076*# Boeing Commercial Airplane Co., Seattle, Wash.
A CRITICAL EVALUATION OF THE PREDICTIONS OF THE NASA-LOCKHEED MULTIELEMENT AIRFOIL COMPUTER PROGRAM Final Report, Jul. 1976 - Jan. 1978
G. W. Brune and J. W. Manke Mar. 1978 67 p refs
(Contract NAS1-14522)
(NASA-CR-145322; D6-45100) Avail: NTIS HC A04/MF A01 CSCL 01A

Theoretical predictions of several versions of the multielement airfoil computer program are evaluated. The computed results are compared with experimental high lift data of general aviation airfoils with a single trailing edge flap, and of airfoils with a leading edge flap and double slotted trailing edge flaps. Theoretical and experimental data include lift, pitching moment, profile drag and surface pressure distributions, boundary layer integral parameters, skin friction coefficients, and velocity profiles. Author

N78-20077*# Boeing Commercial Airplane Co., Seattle, Wash.
AN IMPROVED VERSION OF THE NASA-LOCKHEED MULTIELEMENT AIRFOIL ANALYSIS COMPUTER PROGRAM Final Report
G. W. Brune and J. W. Manke Mar. 1978 204 p refs
(Contract NAS1-14522)
(NASA-CR-145323; D6-45099) Avail: NTIS HC A10/MF A01 CSCL 01A

An improved version of the NASA-Lockheed computer program for the analysis of multielement airfoils is described. The predictions of the program are evaluated by comparison with recent experimental high lift data including lift, pitching moment, profile drag, and detailed distributions of surface pressures and boundary layer parameters. The results of the evaluation show that the contract objectives of improving program reliability and accuracy have been met. Author

N78-20078*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SIMPLIFIED SONIC-BOOM PREDICTION
Harry W. Carlson Mar. 1978 50 p refs
(NASA-TP-1122; L-11794) Avail: NTIS HC A03/MF A01 CSCL 20A

Sonic boom overpressures and signature duration may be predicted for the entire affected ground area for a wide variety of supersonic airplane configurations and spacecraft operating at altitudes up to 76 km in level flight or in moderate climbing or descending flight paths. The outlined procedure relies to a great extent on the use of charts to provide generation and propagation factors for use in relatively simple expressions for signature calculation. Computational requirements can be met by hand-held scientific calculators, or even by slide rules. A variety of correlations of predicted and measured sonic-boom data for airplanes and spacecraft serve to demonstrate the applicability of the simplified method. Author

N78-20079*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND-TUNNEL INVESTIGATION AT MACH NUMBERS FROM 1.90 TO 2.86 OF A CANARD-CONTROLLED MISSILE WITH RAM-AIR-JET SPOILER ROLL CONTROL
A. B. Blair, Jr. Mar. 1978 104 p refs
(NASA-TP-1124; L-11873) Avail: NTIS HC A06/MF A01 CSCL 01A

The efficacy of using a ram-air-jet spoiler roll control device on a typical canard-controlled missile configuration was investigated. For roll control comparisons, conventional aileron controls on the tail fins were also tested. The results indicate that the roll control of the ram-air-jet spoiler tail fins at the highest free-stream Mach number compared favorably with that of the conventional 11-70 area-ratio tail fin ailerons, each deflected 10 deg. The roll control of the tail fin ailerons decreased while that of the ram-air-jet spoiler increased with free-stream Mach number. The addition of the ram-air-jet spoiler tail fins or flow-through tip chord nacelles on the tail fins resulted in only small changes in basic missile longitudinal stability. The axial force coefficient of the operating ram-air-jet spoiler is significantly larger than that of conventional ailerons and results primarily from the total pressure behind a normal shock in front of the nacelle inlets. Author

N78-20080*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF COOLING-HOLE GEOMETRY ON AERODYNAMIC PERFORMANCE OF A FILM-COOLED TURBINE VANE TESTED WITH COLD AIR IN A TWO-DIMENSIONAL CASCADE
John F. Kline, Roy G. Stabe, and Thomas P. Moffitt Mar. 1978 49 p refs
(NASA-TP-1136; E-9174) Avail: NTIS HC A03/MF A01 CSCL 01A

The effect of the orientation and cooling-hole size on turbine-vane aerodynamic losses was evaluated. The contribution of individual vahe regions to the overall effect was also investigated. Test configurations were based upon a representative configuration having 45 spanwise rows of holes spaced about the entire vane profile. Nominal hole diameters of 0.0254 and 0.0356 cm and nominal hole orientations of 35 deg, 45 deg, and 55 deg from the local vane surface and 0 deg, 45 deg, and 90 deg from the main-stream flow direction were investigated. Flow conditions and aerodynamic losses were determined by vane-exit surveys of total pressure, static pressure, and flow angle. Author

N78-20081*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF WINGLETS ON A FIRST-GENERATION JET TRANSPORT WING. 5: STABILITY CHARACTERISTICS OF A FULL-SPAN WING WITH A GENERALIZED FUSELAGE AT HIGH SUBSONIC SPEEDS
Peter F. Jacobs Mar. 1978 71 p refs
(NASA-TP-1163; L-11982) Avail: NTIS HC A04/MF A01 CSCL 01A

The effects of winglets on the static aerodynamic stability characteristics of a KC-135A jet transport model at high subsonic speeds are presented. The investigation was conducted in the Langley 8 foot transonic pressure tunnel using 0.035-scale wing panels mounted on a generalized research fuselage. Data were taken over a Mach number range from 0.50 to 0.95 at angles of attack ranging from -12 deg to 20 deg and sideslip angles of 0 deg, 5 deg, and -5 deg. The model was tested at two Reynolds number ranges to achieve a wide angle of attack range and to determine the effect of Reynolds number on stability. Results indicate that adding the winglets to the basic wing configuration produces small increases in both lateral and longitudinal aerodynamic stability and that the model stability increases slightly with Reynolds number. The winglets do increase the wing bending moments slightly, but the buffet onset characteristics of the model are not affected by the winglets. Author

N78-20082*# Advanced Technology Labs., Inc., Westbury, N. Y.
COMPUTATION OF UNSTEADY TRANSONIC FLOWS THROUGH ROTATING AND STATIONARY CASCADES. 1: METHOD OF ANALYSIS Final Report
John I. Erdos and Edgar Alzner Dec. 1977 131 p refs
(Contract NAS3-16807)
(NASA-CR-2900; ATL-TR-205-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 01A

A numerical method of solution of the inviscid, compressible, two-dimensional unsteady flow on a blade-to-blade stream surface through a stage (rotor and stator) or a single blade row of an axial flow compressor or fan is described. A cyclic procedure has been developed for representation of adjacent blade-to-blade passages which asymptotically achieves the correct phase between all passages of a stage. A shock-capturing finite difference method is employed in the interior of the passage, and a method of characteristics technique is used at the boundaries. The blade slipstreams form two of the passage boundaries and are treated as moving contact surfaces capable of supporting jumps in entropy and tangential velocity. The Kutta condition is imposed by requiring the slipstreams to originate at the trailing edges, which are assumed to be sharp. Results are presented for several transonic fan rotors and compared with available experimental data, consisting of holographic observations of shock structure and pressure contour maps. A subcritical stator solution is also compared with results from a relaxation method. Finally, a periodic solution for a stage consisting of 44 rotor blades and 46 stator blades is discussed. Author

N78-20083# Auburn Univ., Ala. Dept. of Aerospace Engineering.
ANALYSIS AND COMPARISON OF SEVERAL METHODS FOR COMPUTING AERODYNAMIC COMPRESSIBILITY AND INTERFERENCE EFFECTS UP TO CRITICAL MACH NUMBERS Final Report
Fred W. Martin, James Purvis, John E. Burkhalter, and Brent D. Martin Eglin AFB, Fla. AFAL Sep. 1977 62 p refs
(Contract F08635-77-C-0002)
(AD-A050267; AFATL-TR-77-112) Avail: NTIS HC A04/MF A01 CSCL 20/4

Analytical approaches are considered which might be used to improve and extend current aerodynamic analysis to include the compressibility effects up to and including critical Mach numbers. The Rayleigh-Janzen solution is considered for both small disturbance and exact potential flows. A simple numerical method is presented and compared with both experimental results and the results of other analytical methods for potential flow. Author (GRA)

N78-20084# Boeing Aerospace Co., Seattle, Wash.
FLOW FIELD MATCHING Final Report, May 1976 - Jan. 1978
Lawrence J. Dickson, Ki D. Lee, Allen W. Chen, and Paul E. Rubbert Jan. 1978 26 p
(Contract N00014-76-C-0931)
(AD-A050323; D180-24040-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

In a transonic flow problem with subsonic freestream in an untransformed infinite flow field, the outer boundary conditions are hard to apply. By assuming that the flow outside an artificial matching boundary is subcritical and linear, a Prandtl-Glauert

solution is used (generated by panels of Green's function integrals along the matching boundary) in the far field, while solving the near field by finite differences. The two solutions are joined iteratively by requiring continuity of potential and normal derivative across the matching boundary. Two refinements of this method are examined, also. In one, a locally linearized second-order far field solution (a Poisson equation solution) is used. In the second, a middle field inhabited by large rectangular finite elements is used in the area where the flow is highly nonlinear but still subcritical. This report details only the finite element results, the earlier ones having already been published. GRA

N78-20085# ARO, Inc., Arnold Air Force Station, Tenn.
AN ANALYSIS OF TRANSONIC VISCOUS/INVISCID INTERACTIONS ON AXISYMMETRIC BODIES WITH SOLID STINGS OR REAL PLUMES Final Report, 1 Oct. 1976 - 30 Sep. 1977. Ph.D. Thesis - Tennessee Univ.
Steven F. Yaros AEDC Feb. 1978 176 p refs
(AD-A050401; AEDC-TR-77-106) Avail: NTIS HC A09/MF A01 CSCL 20/4

A numerical and theoretical investigation of pressure distribution predictions over arbitrary bodies of revolution in transonic flow has been carried out. Special features of the study include a comprehensive survey of previous and contemporary efforts in this direction and a detailed description of a combined viscous/inviscid digital computer program which was developed to iterate between the inviscid transonic and the viscous portions of the analysis. For attached boundary layers the calculation procedure has been fully automated for both subcritical and supercritical cases, and predicted pressure distributions agree well with data. The entrainment effect of a real plume was modeled using the mixing theory first developed by Chapman and Korst. This method shows promise when its results are compared with data, but further work must be done to more correctly model the turbulent mixing of the two jets.
Author (GRA)

N78-20086# Avco Systems Div., Wilmington, Mass.
HYPERSONIC HEAT TRANSFER TEST PROGRAM IN THE VKI LONGSHOT FACILITY Final Report, 1 Nov. 1976 - 31 Oct. 1977
V. DiCristina 21 Dec. 1977 33 p
(Contract F49620-77-C-0035; Grant AFOSR-2942-76)
(AD-A050295; AVSD-0393-77-CR; AFOSR-78-0111TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The purpose of these tests was to measure local pressure and heat transfer distributions on an ogive body configuration over a range of Mach number and Reynolds number conditions. Both smooth and rough body data were obtained at three degrees angle of attack. Author (GRA)

N78-20087# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
ANALYSIS OF EMPIRICALLY DETERMINED AERODYNAMIC AND RAM COEFFICIENTS FOR A POWER-AUGMENTED-RAM WING-IN-GROUND EFFECT Final Report, Jun. - Oct. 1977
David G. Rousseau Oct. 1977 22 p refs
(AD-A049636; DTNSRDC/ASED-396) Avail: NTIS HC A02/MF A01 CSCL 01/3

With the advent of a theory for power-augmented-ram wing-in-ground-effect vehicle performance, there is a need for detailed comparison with test data. This report presents a comparison of test data with theory, in particular, the determination of the effects of changes in vehicle geometry and cruising height on flight performance. Good correlation between theory and experiment has been achieved for lift and pitching moment, and correlation with drag is promising for some geometries.
Author (GRA)

N78-20088# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
RESEARCH ON VARIOUS ASPECTS OF ATMOSPHERIC FLIGHT Final Technical Report, 1971 - 1976
J. H. Deleeuw and L. D. Reid Nov. 1976 35 p refs
(Grant AF-AFOSR-2091-71)
(AD-A033681; AFOSR-76-1422TR) Avail: NTIS HC A03/MF A01 CSCL 04/1

This research has studied aerodynamic problems in upper atmospheric flight and the disturbed flight of aircraft due to low level turbulence during the approach phase. Individual project summaries include: (1) Calculations have been made for low speed sphere drag in transition flow; experiments confirm the theoretical predictions; (2) An electron beam Doppler profile apparatus has been used to delineate the shape of the distribution function in a heat transfer problem indicating its progressive nonequilibrium nature as the degree of rarefaction increased; (3) An electron beam fluorescence instrument has been designed for rocketborne use to measure upper atmospheric concentrations of nitrogen, molecular oxygen, atomic oxygen, rotational and vibrational temperatures; a number of launches have been made on Black Brant rockets from Fort Churchill (AD 033 680); (4) A laser-Doppler instrument has been constructed and checked out as a means of remotely measuring turbulence in the atmospheric boundary layer; and (5) Wind tunnel measurements in a controlled turbulent shear flow have been made along representative flight paths for STOL vehicles to provide an input to predict dispersions of the landing point. GRA

N78-20089# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
PRESENTATION AND CRITIQUE OF A THEORY ON THE STABILITY OF BAR VORTEX PAIR AND RING VORTICES [DARSTELLUNG UND KRITIK EINER THEORIE UEBER DIE INSTABILITAET VON STABWIRBELPAAR UND RINGWIRBEL]
Wolfgang Ehrhardt Jul. 1977 80 p refs In GERMAN
(MPIS-15/1977) Avail: NTIS HC A05/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 13,80

The simple theory developed by Widnall on the stability of short waves on a vortex ring was critically examined. The theory is based on a bar vortex pair to explain the processes responsible for instability. This theory was applied to ring vortices, and results compared with experiments. It was found that the bar-to-ring vortex transfer needs more exact mathematical treatment; suggestions are made. ESA

N78-20090# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Angewandte Gasdynamik.
A SEMIEMPIRICAL METHOD FOR PREDICTING NORMAL FORCE AND CENTRE OF PRESSURE CHARACTERISTICS OF WING BODY COMBINATIONS AT SUPERSONIC SPEEDS INCLUDING THE NONLINEAR EFFECTS OF BODY CROSSFLOW
Shanka Narayan Seshadri (Natl. Aeron. Lab., Bangalore, India) 28 Jun. 1977 45 p refs
(DLR-FB-77-27) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 20,50

The method developed is based on linear, nonlinear-crossflow and slender body theories with empirical factors. It was extended to wing body combinations having reversed wings using reversibility theorems. A FORTRAN IV program based on the above method was written for a TR 440 computer. An exhaustive comparison of the normal force and center pressure characteristics obtained by the present method with experimental results show excellent agreement for a large variety of wing body combinations including reversed wings. This relatively accurate and rapid method can be made use of for a parametric study of wing body combinations for the purpose of center of pressure level optimization. Author (ESA)

N78-20091# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
ENGINEERING CALCULATION METHODS FOR TURBULENT FLOW, VOLUME 1
P. Bradshaw, T. Cebeci (Douglas Aircraft Comp., Long Beach, Calif.), and J. H. Whitelaw Sep. 1977 123 p refs 3 Vol.
(IC-Aero-77-102-Vol-1) Avail: NTIS HC A06/MF A01

Lecture notes for a short post-experience course held in October 1977 are presented. The 16 lectures are intended as a general review of the state-of-the-art of designers and research workers in aerospace, mechanical, and civil engineering and the environmental sciences. The lectures consider turbulence phenomena, exact equations, empirical turbulence models, numerical procedures, and applications. The 5 lectures in this

volume, following an introduction, deal with conservation equations and boundary conditions for 2-D incompressible flow; zero-equation, 2-equation stress models; stress-equation modeling and scalar models; introductory numerical methods for thin shear layer equations and their boundary and initial conditions; and inviscid/viscid interactions. Author (ESA)

N78-20092# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
ENGINEERING CALCULATION METHODS FOR TURBULENT FLOW, VOLUME 2
P. Bradshaw, T. Cebeci (Douglas Aircraft Comp., Long Beach, Calif.), and J. H. Whitelaw Sep. 1977 104 p refs 3 Vol.
(IC-Aero-77-102-Vol-2) Avail: NTIS HC A06/MF A01

Lecture notes for a short post-experience course held in October 1977 are presented. The 16 lectures are intended as a general review of the state-of-the-art of designers and research workers in aerospace, mechanical and civil engineering, and the environmental sciences. The lectures consider turbulence phenomena, exact equations, empirical turbulence models, numerical procedures, and applications. In this volume 6 lectures are collected on corner flows and slender shear layers; recirculating flows; laser-Doppler anemometry; hot-wire anemometry; standard boundary layer problems for external 2-D and axisymmetric flows; and inverse boundary layer problems. Author (ESA)

N78-20093# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
ENGINEERING CALCULATION METHODS FOR TURBULENT FLOW, VOLUME 3
P. Bradshaw, T. Cebeci (Douglas Aircraft Comp., Long Beach, Calif.), and J. H. Whitelaw Sep. 1977 100 p refs 3 Vol.
(IC-Aero-77-102-Vol-3) Avail: NTIS HC A05/MF A01

Lecture notes for a short post-experience course held in October 1977 are presented. The 16 lectures are intended as a general review of the state-of-the-art of designers and research workers in aerospace, mechanical and civil engineering, and the environmental sciences. The lectures consider turbulence phenomena, exact equations, empirical turbulence models, numerical procedures, and applications. In this volume 4 lectures are presented on calculation of 2-D unsteady and 3-D steady flows; stability and transition; turbomachinery; and combustion. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N78-20094*# American Airlines, Inc., Tulsa, Okla. Maintenance and Engineering Center.
A NEW METHOD FOR ESTIMATING CURRENT AND FUTURE TRANSPORT AIRCRAFT OPERATING ECONOMICS Contractor Report, Jan. 1976 - Oct. 1977
Mar. 1978 278 p refs Revised
(Contract NAS1-14284)
(NASA-CR-145190; D6-42877-Rev) Avail: NTIS HC A13/MF A01 CSCL 05C

A methodology was developed by which the operating cost associated with variations in aircraft design and technology characteristics can be assessed. The assessment method produced a base line estimate of the operating cost elements relating to such design specification features as seat capacity, avionic equipment, design range, and design definition features such as maximum takeoff gross weight, and number of engines. The methodology was applied to assess the operating cost of one potential future advanced technology transport aircraft. An analysis was included to show the relative sensitivity of the operating cost to design parameters. Author

N78-20095# Air Force Civil Engineering Center, Tyndall AFB, Fla.
AN EVALUATION OF THE BIRD/AIRCRAFT STRIKE HAZARD, MALMSTROM AFB, MONTANA
Larry T. Clark and Richard D. Smedley, Jr. Sep. 1977 21 p refs
(AD-A049637; AFCEC-M-9-77) Avail: NTIS HC A02/MF A01 CSCL 01/2

The bird/aircraft strike hazard (BASH) at Malmstrom Air Force Base, Montana, was surveyed during the period 26 August-2 September 1977. Special emphasis was placed on local gull activities which contribute significantly to the bird strike potential. Recommendations aimed at reducing the airfield bird strike potential are part of this report. Author (GRA)

N78-20096# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Graduate Education Div.
AN ECONOMIC ANALYSIS OF A GOVERNMENT SPONSORED, COMMERCIAL CONVERTIBLE AIRCRAFT M.S. Thesis
Robert J. Morgan and Stanley L. Mead Sep. 1977 236 p refs
(AD-A047633; AFIT-LSSR-21-77B) Avail: NTIS HC A11/MF A01 CSCL 01/3

The purpose of the study was to examine the time interval and associated discounted program costs of a government sponsored convertible aircraft. Through the use of a computer model, the researchers examined the relationship of deflated Gross National Product growth, historical air commerce trends, and simulated changes in the composition of the U.S. air carrier fleet resulting from the demand for air transportation. Further, the study examined the impact of wide-bodied aircraft lower hold cargo capability on attaining 100 wide-bodied cargo capable aircraft by 1990 as well as reimbursement by airlines for initial government sponsorship costs when convertible aircraft are transitioned to a freighter mode. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N78-20097 Tennessee Univ., Knoxville.
OPTIMIZATION OF BINARY WIDTH-MODULATED PULSE REBALANCE LOOP ELECTRONICS FOR STRAPDOWN INERTIAL SENSOR APPLICATIONS Ph.D. Thesis
Virgil Atlee Thomason 1977 116 p
Avail: Univ. Microfilms Order No. 78-02042

The basic electronic limitations in the error processing and pulse width-modulating circuitry of a binary rebalance loop for strapdown inertial sensors was defined and explained. A system description on the specific width modulated pulse rebalance loop which formed the basis for optimization, along with design equations and constraints was included. Due to the nonlinearity of the pulse width modulation sections of the loop, a limit cycle analysis was performed. Design guidelines to enable the elimination of the limit cycle phenomenon were obtained which enabled the prediction of limit cycle stability margins. The analysis was accomplished using describing function methods, and a computer program was developed to perform the analysis for a given specific system. Results were shown for a system with a sampling frequency of 2400 hertz, and a closed loop bandwidth less than 100 hertz. Dissert. Abstr.

N78-20098*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT TEST RESULTS OF THE STRAPDOWN HEXAD INERTIAL REFERENCE UNIT (SIRU). VOLUME 3: APPENDICES A-G
Ronald J. Hruby and William S. Bjorkman (Analytical Mechanics Associates, Inc., Mountain View, Calif.) Jul. 1977 104 p
(NASA-TM-73224; A-6974) Avail: NTIS HC A06/MF A01 CSCL 17G

Results of flight tests of the Strapdown Inertial Reference Unit (SIRU) navigation system are presented. The fault tolerant SIRU navigation system features a redundant inertial sensor unit and dual computers. System software provides for detection and isolation of inertial sensor failures and continued operation in the event of failures. Flight test results include assessments of the system's navigational performance and fault tolerance. Selected facets of the flight tests are also described in detail and include some of the following: (1) flight test plans and ground track plots; (2) navigation residual plots; (3) effects of approximations in navigation algorithms; (4) vibration spectrum of the CV-340 aircraft; and (5) modification of the statistical FDICR algorithm parameters for the flight environment. Author

N78-20099# Electromagnetic Compatibility Analysis Center, Annapolis, Md.

THE IMPACT OF A PROPOSED ACTIVE BCAS ON ATCRBS PERFORMANCE IN THE WASHINGTON, D. C., 1981 ENVIRONMENT Final Report

Norman Theberge (ITT Res. Inst., Annapolis) Sep. 1977 49 p (Contract DOT-FA70WAI-175)

(AD-A048589/6; ECAC-PR-77-037; FAA-RD-77-140) Avail: NTIS HC A03/MF A01 CSCL 17/7

A computer model of the proposed active Beacon Collision Avoidance System (BCAS) was developed to investigate the impact of BCAS on the Air Traffic Control Radar Beacon System (ATCRBS) ground system. Predictions were made for the early 1981 Washington, D.C., environment. Two ground environments were simulated, an all-ATCRBS environment and a 25%/75% Discrete Address Beacon System (DABS)/ATCRBS mix. Airborne fruit rates and the effect of BCAS/DABS mode power programming on interference were also predicted. Author

N78-20100*# Ohio Univ., Athens. Avionics Engineering Center.

STAND-ALONE DEVELOPMENT SYSTEM USING A KIM-1 MICROCOMPUTER MODULE

James D. Nickum Mar. 1978 13 p refs (Grant NGR-36-009-017)

(NASA-CR-156067; NASA-TM-56) Avail: NTIS HC A02/MF A01 CSCL 17G

A small microprocessor-based system designed to: contain all or most of the interface hardware, designed to be easy to access and modify the hardware, to be capable of being strapped to the seat of a small general aviation aircraft, and to be independent of the aircraft power system is described. The system is used to develop a low cost Loran C sensor processor, but is designed such that the Loran interface boards may be removed and other hardware interfaces inserted into the same connectors. This flexibility is achieved through memory-mapping techniques into the microprocessor. Author

N78-20101# Electromagnetic Compatibility Analysis Center, Annapolis, Md.

INTERFERENCE ANALYSIS BETWEEN TRSB MICROWAVE LANDING SYSTEM AND ADJACENT C-BAND RADARS Final Report

Ved Nanda (ITT Res. Inst., Annapolis) Jan. 1978 66 p (Contracts DOT-FA70WAI-175; F19628-76-C-0017; AF Proj. 649E)

(AD-A049882; ECAC-PR-76-004; FAA-RD-77-110) Avail: NTIS HC A04/MF A01 CSCL 01/5

The electromagnetic compatibility between the Time Reference Scanning Beam (TRSB) Microwave Landing System (MLS) and adjacent C-band radar systems is investigated. Distance constraints required for compatible operation between these systems were established for the three proposed MLS plans of frequency assignment. Author

N78-20102*# Boeing Commercial Airplane Co., Seattle, Wash.

COCKPIT DISPLAYED TRAFFIC INFORMATION STUDY, PART 2

Sep. 1977 250 p refs Sponsored in part by FAA (Contract NAS1-13267)

(NASA-CR-156115; AD-A049870; D6-42968-Pt-2; FAA-EM-77-18-Pt-2) Avail: NTIS HC A11/MF A01 CSCL 01/5

The planning base for conducting a flight test evaluation of an Electronic Horizontal Situation Indicator (EHSI) incorporating the position of other air traffic as derived from ground sensors was provided. A system concept for an airborne information display utilizing ground derived ATC and ATC related information was defined and an outline of a simulation and flight test program which, includes the NASA 515 aircraft, the Langley Research Center traffic simulation and other aircraft and simulations were prepared. Testing in a busy terminal area was also planned. Author

N78-20103# Technische Universitaet, Brunswick (West Germany). Sonderforschungsbereich 58 Flugfuehrung.

AIR TRAFFIC SAFETY IN THE AIRPORT NEAR RANGE [BEITRAEGE ZUR VERKEHRSSICHERUNG IM FLUGHAFEN-NAHBEREICH]

Mar. 1977 106 p refs In GERMAN (TUBS/SFB58/M4) Avail: NTIS HC A06/MF A01

Topics in the field of airport near range air traffic safety are presented. The computerized simulation of a flight safety system for the near range is discussed, covering air traffic, control, navigation, and collision avoidance. The design of a frequency synthesizer for a quartz oscillator, to provide an onboard frequency standard in a time-synchronous collision avoidance system is reported. A model is described which was developed for representing the statistical selection and distance measurement process in the nonsynchronous SECANT collision avoidance system. For individual titles, see N78-20104 through N78-20107.

N78-20104 Technische Universitaet, Brunswick (West Germany).

SIMULATION AND DEVELOPMENT POSSIBILITIES OF THE MANUAL CONTROL CONCEPT IN THE NEAR RANGE AND CONTROL ZONE [UEBER DIE SIMULATION UND DIE ENTWICKLUNGSMOEGLICHKEITEN DES MANUELLEN KONTROLLKONZEPTES IN NAHVERKERHSBEREICH UND KONTROLLZONE]

D. Brunner *In its* Air Traffic Safety in the Airport Near Range Mar. 1977 p 3-22 refs In GERMAN (For availability see N78-20103 11-04)

Avail: NTIS HC A06/MF A01

Possibilities for improving flight safety in the near range by a stepwise tighter combination of flight safety control, navigation, and collision avoidance were investigated. The current short range traffic was reproduced by simulation of air space structure, air traffic, and manual control. The effects of some control measures were examined, and a system concept for safety and guidance of air traffic was developed. The simulation comprises, as an essential part, a collision protection system integrated into the flight safety system. This system autonomously recognizes collision hazards and calculates avoidance maneuvers taking into account the flight safety situation occurring. ESA

N78-20105 Technische Universitaet, Brunswick (West Germany).

PROGRAM FOR SIMULATION OF AIR TRAFFIC AND AIR SPACE STRUCTURE OF THE FRANKFURT NEAR RANGE, A PLANNING CONTROL AND A COLLISION AVOIDANCE SYSTEM WITH SITUATION DEPENDENT AVOIDANCE MANEUVERS [PROGRAMM ZUR SIMULATION DES LUFTVERKEHRS UND DER LUFTRAUMSTRUKTUR DES NAHBEREICHES FRANKFURT, EINER PLANUNGSKONTROLLE UND EINES KOLLISIONSSCHUTZSYSTEMS MIT SITUATIONSBEDINGTEN AUSWEICHMANOEVER]

D. Brunner *In its* Air Traffic Safety in the Airport Near Range Mar. 1977 p 23-53 In GERMAN (For availability see N78-20103 11-04)

Avail: NTIS HC A06/MF A01

The computerized simulation of a flight safety system in an airport near range is discussed. The underlying concept is based on the present manual flight safety control of the intensively used Frankfurt near range and comprises further developments, combining intricate control, navigation, and collision avoidance. The air traffic simulation covers both simulation of traffic in the near range and components of the flight safety system mentioned. The Frankfurt near range air space was selected in order to permit comparison of real traffic with that simulated. ESA

N78-20106 Technische Universitaet, Brunswick (West Germany).
DEVELOPMENT OF A BINARY FREQUENCY SYNTHESIS AS CONTROL ELEMENT FOR FREQUENCY CORRECTION IN TIME-SYNCHRONOUS COLLISION SYSTEMS WITHOUT ONBOARD ATOMIC FREQUENCY STANDARD AVOIDANCE [ENTWICKLUNG EINER BINAEREN FREQUENZSYNTHESE ALS STELLGLIED ZUR FREQUENZKORREKTUR IN ZEIT-SYNCHRONEN KOLLISIONSSCHUTZSYSTEMEN OHNE ATOMFREQUENZNORMAL AN BORD]
P. Plumeyer *In its* Air Traffic Safety in the Airport Near Range Mar. 1977 p 54-70 In GERMAN (For availability see N78-20103 11-04)
Avail: NTIS HC A06/MF A01

The design of a frequency synthesizer for a quartz oscillator is reported, to provide an onboard frequency standard in a time-synchronous collision avoidance system. The frequency synthesis is binary controlled and allows correction of the quartz frequency. The synthesis circuit satisfies two conditions: high spectral cleanliness of the output signal, and a fast response for commutation of the correction signal. The combination of these conditions was facilitated by the elaboration of optimal frequency plans for the individual circuit stages, allowing separation of signal and noise bounds by using relatively broadband filters.
ESA

N78-20107 Technische Universitaet, Brunswick (West Germany).
DESIGN OF A COLLISION AVOIDANCE SYSTEM MODEL WITH STATISTICAL INTERROGATION [AUFBAU EINES MODELLS EINES KOLLISIONSSCHUTZSYSTEMS MIT STATISTISCHER ABFRAGE]
P. Form, P. Plumeyer, and H.-R. Boecker. *In its* Air Traffic Safety in the Airport Near Range Mar. 1977 p 71-103 In GERMAN (For availability see N78-20103 11-04)
Avail: NTIS HC A06/MF A01

A model was developed to represent the statistical selection and distance measurement processes in the nonsynchronous SECANT collision avoidances system. The relation, between traffic density, warning time, and response range are analyzed. The effect of two correlation modes on interference pulse rates is demonstrated. A calculation is presented of the statistical processes in the correlators, the most important result of which is the determination of the distribution function for readings of the correlator counters.
ESA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N78-20108*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TECHNICAL AND ECONOMIC EVALUATION OF ADVANCED AIR CARGO SYSTEMS
Allen H. Whitehead, Jr. Feb. 1978 38 p refs Presented at Forum on Airfreight Contribution in Securing Markets Abroad Aeroport de Paris, France, 17-18 Nov. 1977
(NASA-TM-78672) Avail: NTIS HC A03/MF A01 CSCL 01C

The current air cargo environment and the relevance of advanced technology aircraft in enhancing the efficiency of the 1990 air cargo system are discussed. NASA preliminary design studies are shown to indicate significant potential gains in aircraft efficiency and operational economics for future freighter concepts. Required research and technology elements are outlined to develop a better base for evaluating advanced design concepts. Current studies of the market operation are reviewed which will develop design criteria for a future dedicated cargo transport. Design features desirable in an all-freighter design are reviewed. NASA-sponsored studies of large, distributed-load freighters are reviewed and these designs are compared to current wide-body aircraft. These concepts vary in gross takeoff weight from 0.5 Gg (one million lbs.) to 1.5 Gg (three million lbs.) and are found to exhibit economic advantages over conventional design concepts.
Author

N78-20109*# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
AEROELASTIC ANALYSIS AND GROUND VIBRATION SURVEY OF THE NASA, GRUMMAN AMERICAN YANKEE MODIFIED FOR SPIN TESTING Final Report, 7 Aug. 1975 - 30 Jun. 1977
Richard A. Kroeger Sep. 1977 263 p refs
(Grant NsG-1229)
(NASA-CR-156119) Avail: NTIS HC A12/MF A01 CSCL 01C

A complete ground vibration and aeroelastic analysis was made of a modified version of the Grumman American Yankee. The aircraft had been modified for four empennage configurations, a wing boom was added, a spin chute installed and provisions included for large masses in the wing tip to vary the lateral and directional inertia. Other minor changes were made which have much less influence on the flutter and vibrations. Neither static divergence nor aileron reversal was considered since the wing structure was not sufficiently changed to affect its static aeroelastic qualities. The aircraft was found to be free from flutter in all of the normal modes explored in the ground shake test. The analysis demonstrated freedom from flutter up to 214 miles per hour.
Author

N78-20110*# Kansas Univ. Center for Research, Inc., Lawrence.
A STUDY OF LOW-COST RELIABLE ACTUATORS FOR LIGHT AIRCRAFT. PART A: CHAPTERS 1-8 Final Report, 15 Jun. 1977 - 15 Mar. 1978
Han Eijsink and Mark Rice Apr. 1978 162 p refs 2 Vol.
(Grant NsG-1421)
(NASA-CR-156142) Avail: NTIS HC A08/MF A01 CSCL 01C

An analysis involving electro-mechanical, electro-pneumatic, and electro-hydraulic actuators was performed to study which are compatible for use in the primary and secondary flight controls of a single engine light aircraft. Actuator characteristics under investigation include cost, reliability, weight, force, volumetric requirements, power requirements, response characteristics and heat accumulation characteristics. The basic types of actuators were compared for performance characteristics in positioning a control surface model and then were mathematically evaluated in an aircraft to get the closed loop dynamic response characteristics. Conclusions were made as to the suitability of each actuator type for use in an aircraft.
Author

N78-20111*# Kansas Univ. Center for Research, Inc., Lawrence.
A STUDY OF LOW-COST RELIABLE ACTUATORS FOR LIGHT AIRCRAFT. PART B: APPENDICES Final Report
Han Eijsink and Mark Rice Apr. 1978 165 p refs 2 Vol.
(Grant NsG-1421)
(NASA-CR-156143; KU-FRL-351-Pt-B) Avail: NTIS HC A08/MF A01 CSCL 01C

Computer programs written in FORTRAN are given for time response calculations on pneumatic and linear hydraulic actuators. The programs are self-explanatory with comment statements. Program output is also included.
Author

N78-20112*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
STUDY OF ADVANCED COMPOSITE STRUCTURAL DESIGN CONCEPTS FOR AN ARROW WING SUPERSONIC CRUISE CONFIGURATION, TASK 3 Final Report
Jan. 1978 381 p refs
(Contract NAS1-12287)
(NASA-CR-145192; D6-42438-4) Avail: NTIS HC A17/MF A01 CSCL 01C

A structural design study was conducted to assess the relative merits of structural concepts using advanced composite materials for an advanced supersonic aircraft cruising at Mach 2.7. The configuration and structural arrangement developed during Task I and II of the study, was used as the baseline configuration. Allowable stresses and strains were established for boron and advanced graphite fibers based on projected fiber properties available in the next decade. Structural concepts were designed and analyzed using graphite polyimide and boron polyimide, applied to stiffened panels and conventional sandwich panels. The conventional sandwich panels were selected as the structural concept to be used on the wing structure. The upper and lower

surface panels of the Task I arrow wing were redesigned using high-strength graphite polyimide sandwich panels over the titanium spars and ribs. The ATLAS computer system was used as the basis for stress analysis and resizing the surface panels using the loads from the Task II study, without adjustment for change in aeroelastic deformation. The flutter analysis indicated a decrease in the flutter speed compared to the baseline titanium wing design. The flutter analysis indicated a decrease in the flutter speed compared to the baseline titanium wing design. The flutter speed was increased to that of the titanium wing, with a weight penalty less than that of the metallic airplane. Author

N78-20113*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SIMPLE METHOD FOR ESTIMATING MINIMUM AUTOROTATIVE DESCENT RATE OF SINGLE ROTOR HELICOPTERS
Peter D. Talbot and Laurel G. Schroers (Army R & T Labs., Moffett Field, Calif.) Mar. 1978 17 p refs
(NASA-TM-78452; A-7134) Avail: NTIS HC A02/MF A01 CSCL 01C

Flight test results of minimum autorotative descent rate are compared with calculations based on the minimum power required for steady level flight. Empirical correction factors are derived that account for differences in energy dissipation between these two flight conditions. A method is also presented for estimating the minimum power coefficient for level flight for any helicopter for use in the empirical estimation procedure of autorotative descent rate. Author

N78-20114*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
DEVELOPMENT OF SYSTEMS AND TECHNIQUES FOR LANDING AN AIRCRAFT USING ONBOARD TELEVISION
Shu W. Gee, Peter C. Carr, William R. Winter, and John A. Manke Feb. 1978 24 p refs
(NASA-TP-1171; H-973) Avail: NTIS HC A02/MF A01 CSCL 01C

A flight program was conducted to develop a landing technique with which a pilot could consistently and safely land a remotely piloted research vehicle (RPRV) without outside visual reference except through television. Otherwise, instrumentation was standard. Such factors as the selection of video parameters, the pilot's understanding of the television presentation, the pilot's ground cockpit environment, and the operational procedures for landing were considered. About 30 landings were necessary for a pilot to become sufficiently familiar and competent with the test aircraft to make powered approaches and landings with outside visual references only through television. When steep approaches and landings were made by remote control, the pilot's workload was extremely high. The test aircraft was used as a simulator for the F-15 RPRV, and as such was considered to be essential to the success of landing the F-15 RPRV. Author

N78-20115*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GROUND DISTANCE COVERED DURING AIRBORNE HORIZONTAL DECELERATION OF AN AIRPLANE
William H. Phillips Apr. 1978 13 p refs
(NASA-TP-1157; L-12008) Avail: NTIS HC A02/MF A01 CSCL 01C

The distance an airplane floats with respect to the ground during deceleration at constant altitude is analyzed taking into account the effects of a constant wind. By use of suitable nondimensionalizing parameters, data applicable to all airplanes are presented by means of a single family of curves. Author

N78-20116*# Boeing Commercial Airplane Co., Seattle, Wash.
STUDY OF ADVANCED COMPOSITE STRUCTURAL DESIGN CONCEPTS FOR AN ARROW WING SUPERSONIC CRUISE CONFIGURATION Final Report
M. J. Turner and D. L. Grande Apr. 1978 122 p refs
(Contract NAS1-12287)
(NASA-CR-2825; D6-42438-5) Avail: NTIS HC A06/MF A01 CSCL 01C

Based on estimated graphite and boron fiber properties, allowable stresses and strains were established for advanced composite materials. Stiffened panel and conventional sandwich panel concepts were designed and analyzed, using graphite/polyimide and boron/polyimide materials. The conventional sandwich panel was elected as the structural concept for the modified wing structure. Upper and lower surface panels of the arrow wing structure were then redesigned, using high strength graphite/polyimide sandwich panels, retaining the titanium spars and ribs from the prior study. The ATLAS integrated analysis and design system was used for stress analysis and automated resizing of surface panels. Flutter analysis of the hybrid structure showed a significant decrease in flutter speed relative to the titanium wing design. The flutter speed was increased to that of the titanium design by selective increase in laminate thickness and by using graphite fibers with properties intermediate between high strength and high modulus values. Author

N78-20117*# McDonnell-Douglas Corp., St. Louis, Mo.
THERMAL DESIGN FOR AREAS OF INTERFERENCE HEATING ON ACTIVELY COOLED HYPERSONIC AIRCRAFT Final Report
R. L. Herring and J. E. Stone Jan. 1978 169 p refs
(Contract NAS1-14140)
(NASA-CR-2828) Avail: NTIS HC A08/MF A01 CSCL 01C

Numerous actively cooled panel design alternatives for application in regions on high speed aircraft that are subject to interference heating effects were studied. Candidate design concepts were evaluated using mass, producibility, reliability and inspectability/maintainability as figures of merit. Three design approaches were identified as superior within certain regimes of the matrix of design heating conditions considered. Only minor modifications to basic actively cooled panel design are required to withstand minor interference heating effects. Designs incorporating internally finned coolant tubes to augment heat transfer are recommended for moderate design heating conditions. At severe heating conditions, an insulated panel concept is required. Author

N78-20118*# Douglas Aircraft Co., Inc., Long Beach, Calif.
EXPANSION OF FLIGHT SIMULATOR CAPABILITY FOR STUDY AND SOLUTION OF AIRCRAFT DIRECTIONAL CONTROL PROBLEMS ON RUNWAYS Final Report
G. W. Kibbee Apr. 1978 106 p refs
(Contract NAS1-13981)
(NASA-CR-2970; MDC-J7727) Avail: NTIS HC A06/MF A01 CSCL 01C

The development, evaluation, and evaluation results of a DC-9-10 runway directional control simulator are described. An existing wide bodied flight simulator was modified to this aircraft configuration. The simulator was structured to use either of two antiskid simulations; (1) an analog mechanization that used aircraft hardware; or (2) a digital software simulation. After the simulation was developed it was evaluated by 14 pilots who made 818 simulated flights. These evaluations involved landings, rejected takeoffs, and various ground maneuvers. Qualitatively most pilots evaluated the simulator as realistic with good potential especially for pilot training for adverse runway conditions. Author

N78-20119# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
PRESSURE CYCLING FATIGUE TESTS OF F-111 CREW MODULE GLASS TRANSPARENCIES Final Report, 1 Jun. 1969 - 1 Jun. 1971
George R. Holderby Mar. 1977 49 p
(AD-A049625; AFFDL-TR-77-12) Avail: NTIS HC A03/MF A01 CSCL 01/3

The F-111 Crew Module Transparencies Fatigue Test Program was initiated to resolve questions on the effects of complete pressure reversals combined with thermal cycling on the fatigue life of the transparencies. A ship-set of transparencies was mounted in a crew escape module and subjected to a simulated flight heating, cooling and pressure environment. The test specimens successfully completed four lifetimes of testing and had residual static strength in excess of the design ultimate load of the escape module. An ambient temperature fatigue test was added to the program to investigate the propagation characteristics of debonded areas in the transparency edge members which were occurring in service. A ship-set of transparencies with debonded areas large enough to require

replacement under applicable technical orders was mounted in an escape module and subjected to simulated subsonic flight usage. The test specimens successfully completed four life times of testing with no failures of the glass and only very small growth of some of the debonded areas. Author (GRA)

N78-20120# Brooks and Perkins, Inc., Livonia, Mich.
GONDOLA SYSTEM FOR HELICOPTER TRANSPORT OF EXTERNAL CARGO Final Report, Nov. 1975 - Jun. 1977
Sep. 1977 41 p refs
(Contract DAAJ02-76-C-0007)
(AD-A047560; USAAMRDL-TR-77-28) Avail: NTIS HC A03/MF A01 CSCL 15/5

This report covers the design, the development, and the static testing of 8x8x10- and 20-foot gondolas. The technical feasibility and performance data provided will permit further study of the transportation of these systems by helicopter. The maximum gross weights of the 10- and 20-foot units are 15,000 and 30,000 pounds respectively. The structure has a rigid, porous floor; an open superstructure; and ISO corner fittings. It is designed to be acquired and released by container handling devices or handled by forklifts. The gondola system is intermodal and consists of a basic center unit (8x8x20 feet) and two end units (8x8x10 feet) that are all modules that can be coupled to make 8x8x40-foot and 8x8x20-foot assemblies. Author (GRA)

N78-20121# Boeing Vertol Co., Philadelphia, Pa.
LIMITATIONS OF THE UTTAS HELICOPTER IN PERFORMING TERRAIN FLYING WITH EXTERNAL LOADS Final Report, Jul. 1976 - Apr. 1977
Irvin B. Alansky, James M. Davis, and Theodore S. Garnett, Jr.
Sep. 1977 113 p refs
(Contract DAAJ02-76-C-0027)
(AD-A047568; D210-11226-1; USAAMRDL-TR-77-22) Avail: NTIS HC A06/MF A01 CSCL 01/2

Quantitative limitations of the UTTAS helicopter performing terrain flying with external loads have been developed using a fully coupled total force and moment simulation math model of the helicopter and external load. Load sway motion and susceptibility to PIO in night/instrument meteorological conditions were identified as the prime source of these limitations. Masking requirements were determined for various external load configurations including a 105mm howitzer and an A-22 ammo bag. Incorporation of a dual hook suspension or load stabilization coupled with a shortened sling suspension offers the best potential for alleviating the limits identified, while providing improved masking requirements and reduction in pilot workload. In addition, the levels of maneuverability possible with the present state-of-the-art visionic systems (including FLIR and NVG), were defined for terrain flying during night operations. Author (GRA)

N78-20122# Kaman Avidyne, Burlington, Mass.
CORRELATION STUDY OF THE UH-1B HELICOPTER BLAST TEST RESULTS FROM THE DICE-THROW EVENT Final Report, 1 Oct. 1976 - 31 May 1977
Garabed Zartarian, Eldine L. Cole, and William N. Lee 1977 222 p refs
(Contract DAAD05-76-C-0772)
(AD-A050463; KA-TR-138; BRL-352) Avail: NTIS HC A10/MF A01 CSCL 01/3

This report summarizes the results of a correlation study conducted in conjunction with the UH-1B helicopter blast test during the DICE THROW event. The processed structural and motion response data from the hovering and droned helicopter are presented. They are correlated with corresponding analytical predictions based primarily on the helicopter code HELP and the aircraft structural code NOVA-2. The monitored blast-induced responses include: (1) the flapwise bending moments and the flapping angles of both the tail and main rotor blade systems; (2) the lateral bending moments at two fin and two tail boom stations; (3) the overall rigid-body motions of the vehicle consisting of the altitude variations, the attitude and angular rate variations in the yaw, pitch, and roll degrees-of-freedom; and (4) the strains at selected points on a tail boom panel, a stiffener, and a longeron. Considering the qualities of the available input data for the analyses and of the measurements, the experimental results are generally in reasonable agreement with the predictions from the HELP code. The NOVA-2 predictions for panel, stiffener, and longeron strains fare poorly when compared with experiment. In some instances, significant differences are found between experiment and analysis. Whenever possible, the reasons for the disagreements are identified and discussed. Author (GRA)

N78-20123# Bell Helicopter Co., Fort Worth, Tex.
AH-1S HIGH-SURVIVABLE TRANSMISSION SYSTEM Final Report, Oct. 1975 - Aug. 1977
David J. Richardson Oct. 1977 143 p refs
(Contract DAAJ02-76-C-0006; DA Proj. 1F2-63208-DB-52)
(AD-A047558; BHT-699-099-059; USAAMRDL-TR-77-30)
Avail: NTIS HC A07/MF A01 CSCL 01/3

The objective of the work performed on this program was to demonstrate that the AH-1S main transmission system modified with internal component improvements but without an emergency lubrication system could operate for 30 minutes following the loss of lubrication. The internal component improvements were based upon work done under a previous Eustis Directorate program conducted by Bell Helicopter Textron. Four different, modified versions of the AH-1S transmission configuration were tested under this program. All loss-of-lube testing was conducted at 950 input horsepower (84 percent of maximum continuous power rating of the AH-1S) and 6600 input rpm. The first transmission configuration tested ran 7 minutes under loss-of-lube conditions before failure of the main input spiral bevel pinion occurred. The second transmission configuration ran 21 minutes before the lower planetary stage failed. The third transmission configuration ran 19 minutes before a lower planetary stage failure occurred. The fourth transmission configuration ran 26.5 minutes before, again, a lower planetary stage failure occurred. It appears that a 30-minute loss-of-lube capability has been achieved for all transmission components except the lower planetary stage. Author (GRA)

N78-20124# United Technologies Corp., Stratford, Conn. Sikorsky Aircraft Div.
HELICOPTER FREEWHEEL UNIT DESIGN GUIDE Final Report, 1974 - Mar. 1977
J. Kish Oct. 1977 239 p refs
(Contract DAAJ02-74-C-0028)
(AD-A047559; USAAMRDL-TR-77-18) Avail: NTIS HC A11/MF A01 CSCL 01/3

This report is intended to aid the transmission designer in selecting an overrunning clutch for use in a helicopter transmission. Preliminary sizing as well as detailed stress analysis procedures are presented for all aspects of spring, sprag, and ramp roller clutch designs. An example of the procedure for each clutch is included. Operation up to 20,000 rpm is feasible if the design procedures presented herein are followed. Author (GRA)

N78-20125# Naval Postgraduate School, Monterey, Calif.
THE FEASIBILITY OF THE JET-FLAP ROTOR AS A LIFT GENERATOR FOR VERTICAL TAKEOFF AND LANDING AIRCRAFT M.S. Thesis
John Charles Ball Dec. 1977 134 p refs
(AD-A050214) Avail: NTIS HC A07/MF A01 CSCL 01/3

The objectives of this study were first to determine the effectiveness of the jet-flap rotor relative to other lift generators, and second to examine the potential effectiveness of the jet-flap rotor in a tactical VTOL aircraft. It was found that the jet-flap rotor has a high theoretical potential, but at present is the least-developed of the lift generators considered. The jet-flap rotor was found to be unattractive as a means of providing vertical lift, except when a long hover duration is necessary. With regard to weight considerations alone, the jet-flap rotor was found to be inadvisable for use in a tactical VTOL aircraft. However, its benign downwash characteristics could make the jet-flap rotor advantageous if high downwash velocities and temperatures could not be tolerated. Author (GRA)

N78-20126# Perceptronics, Inc., Woodland Hills, Calif.
ADAPTIVE ESTIMATION OF INFORMATION VALUES IN CONTINUOUS DECISION MAKING AND CONTROL OF REMOTELY PILOTED VEHICLES Annual Technical Report
Randall Steeb, Ken Chen, and Amos Freedy Aug. 1977 141 p refs
(Contract F44620-76-C-0094)

(AD-A050414; PATR-1037-77-8; AFOSR-78-0193TR) Avail: NTIS HC A07/MF A01 CSCL 05/10

This report describes research and development centered on evaluation of information needs in supervision of remotely piloted vehicles. The selection of information for transmission and display is a recurrent, subjective decision involving many factors -- machine state, operator capabilities, communications costs, and channel limitations among others. An adaptive computer program has been developed which incorporates these factors into a multi-attribute decision model. The program is designed to capture the supervisory operator's decision policy by using a training algorithm based on pattern recognition techniques. Preliminary tests of the adaptive modeling approach were made using a task simulation resembling control of a remotely piloted vehicle. Individual subjects navigated the RPV through a changing, hazardous environment. In doing so, the operators selected different combinations of information and control allocation. The adaptive model was found to be more predictive of the subject's behavior than either a constant, unity weight model or an off-line method of weight estimation. Also, prediction of behavior increased with presentation of model-based recommendations to the subjects. Finally, the model was found to be useful in identifying differing decision strategies. The multi-attribute model thus formulated is expected to find application in evaluation of alternative information needs. Methods for management of communications by the remote element are also discussed.

Author (GRA)

N78-20127# Dornier-System G.m.b.H., Friedrichshafen (West Germany).

MODERN WING TECHNOLOGY FOR GENERAL AVIATION AIRCRAFT Final Report

M. Lotz, B. Huinink, W. Haberland, E. Hoffmann, and W. Staeudlin Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1977 135 p refs In GERMAN; ENGLISH summary

(Contract BMFT-LFK-7530)

(BMFT-FB-W-77-14) Avail: NTIS HC A07/MF A01; ZLDI, Munich DM 28,35

The design and construction of a wing of modern technology (MWT) for general aviation aircraft is reported as well as testing of this wing on a modified Dornier Skyservant. The results of investigations of aerodynamic and structural design and trade-off concerning the application of the MWT on general aviation aircraft are presented. The aerodynamic design of the test-wing shows the clear superiority of the MWT wing section compared to conventional NACA-wing sections, mainly with regard to maximum lift and L/D at high lift coefficients. Wind tunnel investigations, made with the complete experimental model aircraft, partly exceeded theoretical expectations. The result of the flight mechanics investigations shows that in comparison with the original Skyservant version, limitations of the flight-envelope will be necessary because of the modified wing, more powerful engines, and the use of the original empennage. The effect of applying MWT to general aviation aircraft was demonstrated on two basic production aircraft. Results showed remarkable improvements of flight and mission performance (take-off run, climb, and range), relatively small improvements in initial costs, and an obvious reduction of direct operational costs.

Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N78-20128*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A ROTOR-MOUNTED DIGITAL INSTRUMENTATION SYSTEM FOR HELICOPTER BLADE FLIGHT RESEARCH MEASUREMENTS

Vernie H. Knight, Jr., William S. Haywood, Jr., and Milton L. Williams Apr. 1978 49 p refs

(NASA-TP-1146; L-11956) Avail: NTIS HC A03/MF A01 CSCL 01D

A rotor mounted flight instrumentation system developed for helicopter rotor blade research is described. The system utilizes high speed digital techniques to acquire research data from miniature pressure transducers on advanced rotor airfoils which are flight tested on an AH-1G helicopter. The system employs microelectronic pulse code modulation (PCM) multiplexer digitizer stations located remotely on the blade and in a hub mounted metal canister. As many as 25 sensors can be remotely digitized by a 2.5 mm thick electronics package mounted on the blade near the tip to reduce blade wiring. The electronics contained in the canister digitizes up to 16 sensors, formats these data with serial PCM data from the remote stations, and transmits the data from the canister which is above the plane of the rotor. Data are transmitted over an RF link to the ground for real time monitoring and to the helicopter fuselage for tape recording. The complete system is powered by batteries located in the canister and requires no slip rings on the rotor shaft.

Author

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N78-20129*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

LONG-TERM CF6 ENGINE PERFORMANCE DETERIORATION: EVALUATION OF ENGINE S/N 451-479 Final Report

W. H. Kramer and J. J. Smith Feb. 1978 118 p

(Contract NAS3-20631)

(NASA-CR-135381) Avail: NTIS HC A06/MF A01 CSCL 21E

The performance testing and analytical teardown of CF6-6D engine is summarized. This engine had completed its initial installation on DC-10 aircraft. The investigative test program was conducted inbound prior to normal overhaul/refurbishment. The performance testing included an inbound test, a test following cleaning of the low pressure turbine airfoils, and a final test after leading edge rework and cleaning the stage one fan blades. The analytical teardown consisted of detailed disassembly inspection measurements and airfoil surface finish checks of the as received deteriorated hardware. Included in this report is a detailed analysis of the test cell performance data, a complete analytical teardown report with a detailed description of all observed hardware distress, and an analytical assessment of the performance loss (deterioration) relating measured hardware conditions to losses in both SFC (specific fuel consumption) and EGT (exhaust gas temperature).

Author

N78-20130*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TWO-DIMENSIONAL COLD-AIR CASCADE STUDY OF A FILM-COOLED TURBINE STATOR BLADE. 4: COMPARISON OF EXPERIMENTAL AND ANALYTICAL AERODYNAMIC RESULTS FOR BLADE WITH 12 ROWS OF 0.076-CENTIMETER-(0.030-INCH-) DIAMETER HOLES HAVING STREAMWISE EJECTION ANGLES

Herman W. Prust, Jr. Mar. 1978 30 p refs

(NASA-TP-1151; E-9187) Avail: NTIS HC A03/MF A01 CSCL 21E

Previously published experimental aerodynamic efficiency results for a film cooled turbine stator blade are compared with analytical results computed from two published analytical methods. One method was used as published; the other was modified for certain cases of coolant discharge from the blade suction surface. For coolant ejection from blade surface regions where the surface static pressures are higher than the blade exit pressure, both methods predict the experimental results quite well. However, for ejection from regions with surface static pressures lower

than the blade exit pressure, both methods predict too small a change in efficiency. The modified method gives the better prediction. Author

N78-20131*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A SHORT ANNULAR DUMP DIFFUSER USING SUCTION-STABILIZED VORTICES AT INLET MACH NUMBERS TO 0.41
John M. Smith and Albert J. Juhasz Apr. 1978 40 p refs
(NASA-TP-1194; E-9332) Avail: NTIS HC A03/MF A01 CSCL 21E

A short, annular dump diffuser was designed to use suction to establish stabilized vortices on both walls for improved flow expansion in the region of an abrupt area change. The diffuser was tested at near ambient inlet pressure and temperature. The overall diffuser area ratio was 4.0. The inlet height was 2.54 cm and the exit pitot-static rakes were located at a distance from the vortex fence equal to two or six times the inlet height. Performance data were taken at near ambient temperature and pressure for nominal inlet Mach numbers of 0.18 to 0.41 with suction rates of 0 to 18 percent of the total inlet airflow. The exit velocity profile could be shifted toward either wall by adjusting the inner- or outer-wall suction rate. Symmetrical exit velocity profiles were unstable, with a tendency to shift back to hub- or tip-weighted profile. Diffuser effectiveness was increased from about 47 percent without suction to over 85 percent at a total suction rate of about 14 percent. The diffuser total pressure losses at inlet Mach numbers of 0.18 and 0.41 decreased from 1.1 and 5.6 percent without suction to 0.48 and 5.2 percent at total suction rates of 14.4 and 5.6 percent, respectively. Author

N78-20132*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATED FLIGHT EFFECTS ON NOISE CHARACTERISTICS OF A FAN INLET WITH HIGH THROAT MACH NUMBER
Howard L. Wesoky, Donald A. Dietrich, and John M. Abbott Apr. 1978 45 p refs
(NASA-TP-1199; E-9253) Avail: NTIS HC A03/MF A01 CSCL 21E

An anechoic wind tunnel experiment was conducted to determine the effects of simulated flight on the noise characteristics of a high throat Mach number fan inlet. Comparisons were made with the performance of a conventional low throat Mach number inlet with the same 50.8 cm fan noise source. Simulated forward velocity of 41 m/sec reduced perceived noise levels for both inlets, the largest effect being more than 3 db for the high throat Mach number inlet. The high throat Mach number inlet was as much as 7.5 db quieter than the low throat Mach number inlet with tunnel airflow and about 6 db quieter without tunnel airflow. Effects of inlet flow angles up to 30 deg were seemingly irregular and difficult to characterize because of the complex flow fields and generally small noise variations. Some modifications of tones and directivity at blade passage harmonics resulting from inlet flow angle variation were noted. Author

N78-20133*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TWO-DIMENSIONAL COLD-AIR CASCADE STUDY OF A FILM-COOLED TURBINE STATOR BLADE. 5: COMPARISON OF EXPERIMENTAL AND ANALYTICAL AERODYNAMIC RESULTS FOR BLADE WITH 12 ROWS OF 0.038-CENTIMETER-(0.015 INCH) DIAMETER COOLANT HOLES HAVING STREAMWISE EJECTION ANGLES
Herman W. Prust, Jr. Apr. 1978 23 p refs
(NASA-TP-1204; E-9342) Avail: NTIS HC A02/MF A01 CSCL 21E

Published experimental aerodynamic efficiency results were compared with results predicted from two published analytical methods. This is the second of two such comparisons. One of the analytical methods was used as published; the other was modified for certain cases of coolant discharge from the blade suction surface. The results show that for 23 cases of single row and multirow discharge covering coolant fractions from 0 to about 9 percent, the difference between the experimental and predicted results was no greater than about 1 percent in any case and less than 1/2 percent in most cases. Author

N78-20134# Naval Air Propulsion Test Center, Trenton, N.J.
EFFECTIVENESS OF THE REAL TIME FERROGRAPH AND OTHER OIL MONITORS AS RELATED TO OIL FILTRATION
Daniel Popgoshev and Raymond Valori Nov. 1977 69 p refs
(AD-A049334; NAPC-PE-2) Avail: NTIS HC A04/MF A01 CSCL 11/8

A development model of an oil monitor known as the Real Time (R.T.) Ferrograph was evaluated on a bench tester to determine its effectiveness in detecting rolling contact fatigue or scoring type failures, especially as influenced by various levels of oil filtration. Comparisons of the R.T. Ferrograph are made with spectrometric oil analysis, a light scattering and attenuation device, an X-ray fluorescence device, a particle counter, and the analytical Ferrograph. Results of the testing showed the R.T. Ferrograph to be effective in detecting failures when the oil filtration level was above 40 micrometers. In addition, it correlates well with the other oil monitors at these filtration levels. Below the 40 micrometer oil filtration level the R.T. Ferrograph was found to be ineffective. Author (GRA)

N78-20135# RAND Corp., Santa Monica, Calif.
LIFE-CYCLE ANALYSIS OF AIRCRAFT TURBINE ENGINES Interim Report
J. R. Nelson Nov. 1977 122 p refs
(Contract F49620-77-C-0023)
(AD-A050349; R-2103-AF) Avail: NTIS HC A06/MF A01 CSCL 21/5

The report presents a methodology enabling the weapon system planner to acquire early visibility of cost magnitudes, proportions, and trends associated with a new engine's life cycle, and to identify 'drivers' that increase cost and can have the effect of lowering capability. Later in the life cycle, logistics managers can use the methodology and the feedback it produces for more effective system management. The procedure followed was to: develop a theoretical framework for each phase of the life cycle; collect and analyze data for each phase; develop parametric cost-estimating relationships (CERs) for each phase; use the CERs in examples to ascertain behavior and obtain insights into cost magnitudes, proportions, and trends, and to identify cost-drivers and their effects; and examine commercial experience for cost data and operational and maintenance practices that could be profitable for the Air Force. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N78-20136*# Lockheed-California Co., Burbank.
ROTORCRAFT LINEAR SIMULATION MODEL VOLUME 1: ENGINEERING DOCUMENTATION Final Report, Nov. 1976 - Jan. 1978
J. S. Reaser Jan. 1978 185 p ref 3 Vol.
(Contract NAS2-9374)
(NASA-CR-152079-Vol-1; LR-28200-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 01C

A rotorcraft small perturbation linear model is described. Rotor flap, inplane and feathering degrees of freedom, as well as control and augmentation systems are defined in addition to the classical vehicle six degrees of freedom. The primary application was intended to be an analytic tool to assess the handling qualities of a dynamically combined main rotor and body. The modeling method retained the higher frequency response properties which aided in evaluating control and stability augmentation systems. Author

N78-20137*# Lockheed-California Co., Burbank.
ROTORCRAFT LINEAR SIMULATION MODEL VOLUME 2: COMPUTER IMPLEMENTATION Final Report, Nov. 1976 - Jan. 1978
J. S. Reaser and D. H. Saiki Jan. 1978 77 p ref 3 Vol.
(Contract NAS2-9374)
(NASA-CR-152079-Vol-2; LR-28200-Vol-2) Avail: NTIS

HC A05/MF A01 CSCL 01C

A computer program used to process the equations is presented, and a full description of equation implementation is given. The model was implemented in the IBM 360 and CDC series computer systems. M.V.

N78-20138*# Lockheed-California Co., Burbank.
ROTORCRAFT LINEAR SIMULATION MODEL. VOLUME 3: USER'S MANUAL Final Report, Nov. 1976 - Jan. 1978
J. S. Reaser Jan. 1978 68 p ref 3 Vol.
(Contract NAS2-9374)
(NASA-CR-152079-Vol-3; LR-28200-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 01C

For abstract, see N78-20137

N78-20139*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SIMULATOR EVALUATION OF A FLIGHT-PATH-ANGLE CONTROL SYSTEM FOR A TRANSPORT AIRPLANE WITH DIRECT LIFT CONTROL
Wendell W. Kelley Mar. 1978 33 p refs
(NASA-TP-1116; L-11947) Avail: NTIS HC A03/MF A01 CSCL 01C

A piloted simulator was used to evaluate the flight path angle control capabilities of a system that employs spoiler direct lift control. The system was designated the velocity vector control system and was compared with a baseline flight path angle control system which used elevator for control. The simulated airplane was a medium jet transport. Research pilots flew a manual instrument landing system glide slope tracking task and a variable flight path angle task in the landing configuration to obtain comparative performance data. Author

N78-20140*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
FLIGHT EVALUATION OF THE TRANSONIC STABILITY AND CONTROL CHARACTERISTICS OF AN AIRPLANE INCORPORATING A SUPERCRITICAL WING
Neil W. Matheny and Donald H. Gatlin Feb. 1978 61 p refs (NASA-TP-1167; H-916) Avail: NTIS HC A04/MF A01 CSCL 01C

A TF-8A airplane was equipped with a transport type supercritical wing and fuselage fairings to evaluate predicted performance improvements for cruise at transonic speeds. A comparison of aerodynamic derivatives extracted from flight and wind tunnel data showed that static longitudinal stability, effective dihedral, and aileron effectiveness, were higher than predicted. The static directional stability derivative was slower than predicted. The airplane's handling qualities were acceptable with the stability augmentation system on. The unaugmented airplane exhibited some adverse lateral directional characteristics that involved low Dutch roll damping and low roll control power at high angles of attack and roll control power that was greater than satisfactory for transport aircraft at cruise conditions. Longitudinally, the aircraft exhibited a mild pitchup tendency. Leading edge vortex generators delayed the onset of flow separation, moving the pitchup point to a higher lift coefficient and reducing its severity. Author

N78-20141*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
RELIABLE DUAL-REDUNDANT SENSOR FAILURE DETECTION AND IDENTIFICATION FOR THE NASA F-8 DFBW AIRCRAFT Final Report, Jun. 1975 - May 1977
James C. Deckert, Mukund N. Desai, John J. Deyst, Jr., and Alan S. Willsky (MIT, Cambridge) Feb. 1978 216 p refs
(Contract NAS1-13914)
(NASA-CR-2944; R-1077) Avail: NTIS HC A10/MF A01 CSCL 01C

A technique was developed which provides reliable failure detection and identification (FDI) for a dual redundant subset of the flight control sensors onboard the NASA F-8 digital fly by wire (DFBW) aircraft. The technique was successfully applied to simulated sensor failures on the real time F-8 digital simulator and to sensor failures injected on telemetry data from a test flight of the F-8 DFBW aircraft. For failure identification the technique utilized the analytic redundancy which exists as functional and kinematic relationships among the various quantities being measured by the different control sensor types. The technique can be used not only in a dual redundant sensor system, but also in a more highly redundant system after FDI by conventional voting techniques reduced to two the number of unfailed sensors of a particular type. In addition the technique can be easily extended to the case in which only one sensor of a particular type is available. Author

N78-20142*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STUDY OF THE USE OF A NONLINEAR, RATE-LIMITED FILTER ON PILOT CONTROL SIGNALS
James J. Adams Apr. 1978 41 p refs
(NASA-TP-1147; L-11762) Avail: NTIS HC A03/MF A01 CSCL 01C

The use of a nonlinear, rate limited filter for rejecting the remnant (noise) in a pilot's control signal was studied through both an analytical study using pilot models and a simulation study using experienced test pilots. The nonlinear filter was compared with a linear filter and with no filter for both attitude and altitude control tasks. The results show that the nonlinear filter does promote rapid, steady maneuvering better than either the linear filter or the no filter condition. In addition, if the rate limit in the nonlinear filter is set so that it is too restrictive, a pilot induced unstable altitude oscillation can result. Author

N78-20143*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PILOT-MODEL ANALYSIS AND SIMULATION STUDY OF EFFECT OF CONTROL TASK DESIRED CONTROL RESPONSE
James J. Adams, Joseph Gera, and Joel B. Jaudon Apr. 1978 46 p refs
(NASA-TP-1140) Avail: NTIS HC A03/MF A01 CSCL 01C

A pilot model analysis was performed that relates pilot control compensation, pilot aircraft system response, and aircraft response characteristics for longitudinal control. The results show that a higher aircraft short period frequency is required to achieve superior pilot aircraft system response in an altitude control task than is required in an attitude control task. These results were confirmed by a simulation study of target tracking. It was concluded that the pilot model analysis provides a theoretical basis for determining the effect of control task on pilot opinions. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N78-20144*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TESTPLT: INTERACTIVE COMPUTER PROCEDURE FOR WIND-TUNNEL-DATA MANAGEMENT, RETRIEVAL, COMPARISON, AND PLOTTING
Harry H. Heyson Feb. 1978 89 p
(NASA-TM-78663) Avail: NTIS HC A05/MF A01 CSCL 14B

A method of maintaining, retrieving, comparing, and plotting wind-tunnel data by means of an interactive remote computer terminal is described. The software associated with the method consists of two procedure files, three computer programs, and a submittal file, all of which are discussed. The procedure was based on maintaining the basic wind-tunnel data files in the Langley standard interface tape (SIFT) format. The SIFT format was not part of the present development. Those features of the format essential to the present use were described. The entire method was illustrated by sample executions from a remote terminal. Author

N78-20145*# Massachusetts Inst. of Tech., Cambridge. Aerophysics Lab.
APPLICATION OF DIGITAL CONTROL TO A MAGNETIC MODEL SUSPENSION AND BALANCE MODEL

Final Report, 1 Apr. 1976 - 30 Nov. 1977
P. D. Luh, E. E. Covert, H. P. Whitaker, and C. W. Haldeman Jan. 1978 125 p refs
(Grant NsG-1292)
(NASA-CR-145316; MIT-TR-198) Avail: NTIS HC A06/MF A01 CSCL 14B

The feasibility of using a digital computer for performing the automatic control functions for a magnetic suspension and balance system (MSBS) for use with wind tunnel models was investigated. Modeling was done using both a prototype MSBS and a one dimensional magnetic balance. A microcomputer using the Intel 8080 microprocessor is described and results are given using this microprocessor to control the one dimensional balance. Hybrid simulations for one degree of freedom of the MSBS were also performed and are reported. It is concluded that use of a digital computer to control the MSBS is eminently feasible and should extend both the accuracy and utility of the system. Author

N78-20146# Naval Submarine Medical Research Lab., Groton, Conn.
IMPLEMENTING AN EXCHANGE FROM NITROGEN TO HELIUM IN A LARGE HYPERBARIC CHAMBER Interim Report
Kenneth R. Bondi, D. Douglas Wray, and James E. Jordan 21 Sep. 1977 13 p refs
(AD-A049273) Avail: NTIS HC A02/MF A01 CSCL 13/4

A 954 cubic foot (27 cubic meter) hyperbaric chamber at a pressure of 4 atmospheres absolute was purged of a nitrogen/oxygen gas mixture (92.5%/7.5%) by flushing with 100% helium. The helium entered the top of the chamber, and the N2/O2 exited at the bottom so that the lighter gas layered above the heavier gas. Turbulence was kept to a minimum by turning off the life support system, limiting movement of inside divers, and by utilizing overboard dump masks for the breathing gas. Use of the layering technique allowed the chamber to be completely purged of N2/O2 in 55 minutes, using 8,143 cu ft (230 cu meters) of helium. If the layering technique had worked perfectly at the flow rate used (148 cu ft/min (4.19 cu meters/min.)), it would have taken 26 minutes and 3,816 cu ft (108 cu meters) of gas to rid the chamber of nitrogen. On the other hand, if the incoming gas mixed completely and instantaneously with the chamber gas, it would have taken 117 minutes and 17,316 cu ft (511 cu meters) of gas to bring the chamber nitrogen concentration below 1%. Thus, by avoiding unnecessary turbulence and thereby taking advantage of the layering phenomenon, the best estimate in saving of time and gas is approximately one hour and 9,000 cu ft (255 cu meters) of helium. In experiments where the environmental gas must be changed from a dense gas to a lighter gas and time and/or gas saving is important, the layering phenomenon may be used advantageously by limiting the degree of mixing. GRA

N78-20147# Army Construction Engineering Research Lab., Champaign, Ill.
DEVELOPMENT OF A PAVEMENT MAINTENANCE SYSTEM. VOLUME 1: AIRFIELD PAVEMENT CONDITION RATING Final Report, Jul. 1974 - Jul. 1976
Mohamed Y. Shahin, Michael I. Darter, and Starr D. Kohn Dec. 1977 232 p refs Supersedes AFCEC-TR-76-27 2 Vol.
(MIPR FQ-8952-76-66005)
(AD-A048884; CERL-TR-C-76-Vol-1; CEEDO-TR-77-44-Vol-1; AFCEC-TR-76-27) Avail: NTIS HC A11/MF A01 CSCL 01/5

This report describes the development and verification of a pavement condition index (PCI) for rating the condition of jointed concrete and asphalt-or tar-surfaced airfield pavements. The PCI, which measures airfield pavement structural integrity and surface operational condition, is calculated based on measured pavement distress types, severities, and densities obtained during an inspection of the pavement. GRA

N78-20148*# Air Force Civil and Environmental Engineering Office, Tyndall AFB, Fla.
SMOKE ABATEMENT FOR DOD TEST CELLS Final Report, 20 Nov. 1976 - 30 May 1977
Bradford C. Grems, III Jul. 1977 109 p refs
(AF Proj. 2103)
(AD-A050223; CEEDO-TR-77-40) Avail: NTIS HC A06/MF A01 CSCL 06/6

The Department of Defense owns and operates nearly 200 jet engine test cells. Occasionally, visible exhaust smoke is emitted from these structures. Several pollution control agencies, most notably the state of California, have expressed interest in limiting test cell smoke emissions. A review committee composed of various Air Force and Navy representatives recommended further study of fuel additives as a means of achieving this goal. They recognized additives as the most promising near term solution to the test cell smoke problem. Ferrocene appeared to be the best of existing additives. Studies were undertaken to determine the environmental impact, toxicological hazards and engine effects associated with routine ferrocene use. Four types of Navy turbine engines were tested for ten hours each using ferrocene. These tests indicated that engines suffered no harm attributable to ferrocene, but that the additive must be certified for each engine type on a individual basis. Emission measurements made during the tests showed that most pollutants are virtually unchanged in quantity and character by ferrocene use and that particulate matter is actually reduced. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N78-20149# Committee on Science and Technology (U. S. House).
SPACE INDUSTRIALIZATION
Washington GPO 1977 206 p refs Hearing before Subcomm. on Space Sci. and Application of the Comm. on Sci. and Technol., 95th Congr., 1st Sess., 29 Sep. 1977
(GPO-99-159) Avail: Subcomm. on Space Sci. and Applications

The advantages of using satellites for improved personal communications, educational television, and teleconferencing, as well as for continuous unattended tracking and location of vehicles, shipments, and nuclear materials were described. The capabilities of space shuttles and the technology requirements for constructing earth-orbiting factories to exploit zero gravity, constant solar power, and perfect vacuum conditions for space processing and manufacturing were explored. The mass-driver reaction engine concept was also discussed. A.R.H.

N78-20150*# Kentucky Univ., Lexington. Boiling and Phase Change Lab.
CONCEPTUAL DESIGN FOR SPACELAB POOL BOILING EXPERIMENT
John H. Lienhard and Robert E. Peck Mar. 1978 71 p refs
(Contract NAS3-20397)
(NASA-CR-135378; UKY-TR106-78-ME15) Avail: NTIS HC A04/MF A01 CSCL 22A

A pool boiling heat transfer experiment to be incorporated with a larger two-phase flow experiment on Spacelab was designed to confirm (or alter) the results of earth-normal gravity experiments which indicate that the hydrodynamic peak and minimum pool boiling heat fluxes vanish at very low gravity. Twelve small sealed test cells containing water, methanol or Freon 113 and cylindrical heaters of various sizes are to be built. Each cell will be subjected to one or more 45 sec tests in which the surface heat flux on the heaters is increased linearly until the surface temperature reaches a limiting value of 500 C. The entire boiling process will be photographed in slow-motion. Boiling curves will be constructed from thermocouple and electric input data, for comparison with the motion picture records. The conduct of the experiment will require no more than a few hours of operator time. Author

N78-20151*# National Aeronautics and Space Administration, Washington, D. C.
ON THE SHOULDERS OF TITANS: A HISTORY OF PROJECT GEMINI
Barton C. Hacker 1977 634 p refs Original contains color illustrations
(NASA-SP-4203) Avail: NTIS MF A01; SOD HC $8.25 CSCL 22A

Gemini was the intermediate manned space flight program between America's first steps into space with Mercury and the manned lunar expeditions of Apollo. Because of its position between these two other efforts, Gemini is probably less remembered. Still, it more than had its place in man's progress into this new frontier. Gemini accomplishments were manyfold. They included many firsts: first astronaut-controlled maneuvering in space; first rendezvous in space of one spacecraft with another; first docking of one spacecraft with a propulsive stage and use of that stage to transfer man to high altitude; first traverse of man into the earth's radiation belts; first extended manned flights of a week or more in duration; first extended stays of man outside his spacecraft; first controlled reentry and precision landing; and many more. These achievements were significant in ways one cannot truly evaluate even today, but two things stand out: (1) it was the time when America caught up and surpassed the Soviet Union in manned space flight, and (2) these demonstrations of capability were an absolute prerequisite to the phenomenal Apollo accomplishments then yet to come. Author

N78-20152*# Measurement Analysis Corp., Boulder, Colo.
RESEARCH STUDIES USING OSO-6 ZODIACAL LIGHT EXPERIMENT DATA Final Report
Nov. 1977 101 p refs
(Contract NASw-2902)
(NASA-CR-156112) Avail: NTIS HC A06/MF A01 CSCL 22A

The results of research studies on the OSO-6 zodiacal light experiment, conducted during the period from May 1976 to October 1977 are described. A discussion is included of the instrument performance and the empirical calibrations developed. Main areas of the research performed, i.e., (1) zodiacal light variation analysis; (2) integrated starlight and diffuse galactic light; and (3) earth/moon libration region counterglow, are covered. Considerable data processing was performed during these studies and it is summarized. Recommendations for future research to complete the interim results are given. Author

N78-20153*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
INFORMATION SERVICES PLATFORMS AT GEOSYNCHRONOUS EARTH ORBIT: A REQUIREMENTS ANALYSIS
Feb. 1978 169 p
(Contract NAS1-12436)
(NASA-CR-156117; MDC-G7308) Avail: NTIS HC A08/MF A01 CSCL 22A

The potential user requirements for Information Services Platforms at geosynchronous orbits were investigated. A rationale for identifying the corollary system requirements and supporting research and technology needs was provided. Author

N78-20154*# Martin Marietta Corp., Denver, Colo.
RESEARCH STUDY TO IDENTIFY TECHNOLOGY REQUIREMENTS FOR ADVANCED EARTH-ORBITAL TRANSPORTATION SYSTEMS, DUAL-MODE PROPULSION
[1977] 49 p refs
(Contract NAS1-13916)
(NASA-CR-2867; MCR-77-010) Avail: NTIS HC A03/MF A01 CSCL 22A

The results of a study of dual mode propulsion concepts applied to advanced earth orbital transportation systems using reuseable single stage to orbit vehicle concepts were summarized. Both series burn and parallel burn modes of propulsion were analyzed for vertical takeoff, horizontal landing vehicles based on accelerated technology goals. A major study objective was to assess the merits of dual mode main propulsion concepts compared to single mode concepts for carrying payloads of Space Shuttle type to orbit. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N78-20155*# Michigan Univ., Ann Arbor.
OPTIMAL SINGULAR CONTROL WITH APPLICATIONS TO TRAJECTORY OPTIMIZATION
Nguyen X. Vinh [1977] 94 p refs
(Grant NsG-1448)
(NASA-CR-156135) Avail: NTIS HC A05/MF A01 CSCL 22A

A comprehensive discussion of the problem of singular control is presented. Singular control enters an optimal trajectory when the so called switching function vanishes identically over a finite time interval. Using the concept of domain of maneuverability, the problem of optical switching is analyzed. Criteria for the optimal direction of switching are presented. The switching, or junction, between nonsingular and singular subarcs is examined in detail. Several theorems concerning the necessary, and also sufficient conditions for smooth junction are presented. The concepts of quasi-linear control and linearized control are introduced. They are designed for the purpose of obtaining approximate solution for the difficult Euler-Lagrange type of optimal control in the case where the control is nonlinear. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N78-21042# Joint Publications Research Service, Arlington, Va.
VISIT TO THE BAYKONUR SPACEPORT
V. Karin, A. Khaldeyev, and I. Yudin *In its* Transl. on USSR Sci. and Technol. (JPRS-70873) 31 Mar. 1978 p 23-39 Transl. into ENGLISH from Nauk Zhizh (Moscow), no. 1, 1978 p 66-75 (For availability see N78-21041 11-99)
Copyright. Avail: Issuing Activity

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N78-20156*# Boeing Aerospace Co., Seattle, Wash. Space Div.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 1 AND PART 2, VOLUME 2: TECHNICAL SUMMARY Final Report
Dec. 1977 202 p
(Contract NAS9-15196)
(NASA-CR-151666; D180-22876-2-Pt-1-Vol-2; D180-22876-2-Pt-2-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 10A

Practical designs for power transmission were developed to meet requirements and constraints. Microwave link error was analyzed to confirm attainability of acceptable link efficiency. Silicon photovoltaic was determined to be the best overall choice for energy conversion, with a potassium Rankine cycle as the backup choice. Space transportation operations provide low cost because of traffic level, and the payload volume is the launch vehicle design driver. The power cost is 4 to 5 ¢/kwh, which will be competitive with fossil fuel sources by the year 2000. Author

N78-20157*# Boeing Aerospace Co., Seattle, Wash. Space Div.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 2, VOLUME 3: SPS SATELLITE SYSTEMS Final Report

Dec. 1977 221 p refs
(Contract NAS9-15196)
(NASA-CR-151667; D180-22876-3-Pt-2-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 10A

The differences in approach to solar energy conversion by solar cells and thermal engine systems are examined. Systems requirements for the solar power satellite (SPS) are given along with a description of the primary subsystems. Trades leading to exact configuration selection, for example, selection of the Rankine cycle operating temperatures are explained, and two satellite configurations are discussed. Author

N78-20158*# Boeing Aerospace Co., Seattle, Wash. Space Div.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 2, VOLUME 4: MICROWAVE POWER TRANSMISSION SYSTEMS Final Report
Dec. 1977 283 p refs
(Contract NAS9-15196)
(NASA-CR-151668; D180-22876-4-Pt-2-Vol-4) Avail: NTIS HC A13/MF A01 CSCL 10A

A slotted waveguide planar array was established as the baseline design for the spaceborne transmitter antenna. Key aspects of efficient energy conversion at both ends of the power transfer link were analyzed and optimized alternate approaches in the areas of antenna and tube design are discussed. An integrated design concept was developed which meets design requirements, observes structural and thermal constraints, exhibits good performance and was developed in adequate depth to permit cost estimating at the subsystem/component level. Author

N78-20159*# Boeing Aerospace Co., Seattle, Wash. Space Div.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 2, VOLUME 5: SPACE OPERATIONS (CONSTRUCTION AND TRANSPORTATION) Final Report
Keith Miller and Eldon E. Davis Dec. 1977 282 p
(Contract NAS9-15196)
(NASA-CR-151669; D180-22876-5-Pt-2-Vol-5) Avail: NTIS HC A13/MF A01 CSCL 10A

Construction and transportation systems and operations are described for the following combinations: (1) silicon photovoltaic CR = 1 satellite constructed primarily in low earth orbit (LEO); (2) silicon photovoltaic CR = 1 satellite constructed in geosynchronous earth orbit (GEO); (3) Rankine thermal engine satellite constructed primarily in LEO; and (4) Rankine thermal engine satellite constructed in GEO. Author

N78-20160*# Boeing Aerospace Co., Seattle, Wash. Space Div.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 2, VOLUME 6: EVALUATION DATA BOOK Final Report
Dec. 1977 307 p
(Contract NAS9-15196)
(NASA-CR-151670; D180-22876-6-Pt-2-Vol-6) Avail: NTIS HC A14/MF A01 CSCL 10A

The actual calculations of mass properties, costs, and uncertainties are presented for the final reference designs of the solar power satellite system. Author

N78-20161*# Boeing Aerospace Co., Seattle, Wash. Space Div.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY, VOLUME 7 Final Briefing
13 Dec. 1977 442 p
(Contract NAS9-15196)
(NASA-CR-151671; D180-22876-7-Vol-7) Avail: NTIS HC A19/MF A01 CSCL 10A

Guidelines and assumptions used in the design of a system of geosynchronous satellites for transmitting solar power to earth were discussed as well as the design evolutions of the principle types of solar power satellites and space support systems. A.R.H.

N78-20162*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 1 AND PART 2, VOLUME 1: EXECUTIVE SUMMARY
Dec. 1977 31 p
(Contract NAS9-15196)
(NASA-CR-151665; D180-22876-1-Pt-1-Vol-1; D180-22876-1-Pt-2-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22B

The Solar Power Satellite principle is illustrated and it shows that in a geostationary orbit 36,000 km above the earth's equator, each SPS is in sunlight 99% of the time and in continuous line of sight contact with its ground receiving station. Electrical power produced on the satellite by photovoltaic or heat engine conversion of sunlight is then converted to radio frequency energy at high efficiency, and formed into a focused beam precisely aimed at the SP ground stations. The ground station receiving antenna reconverts the energy into electricity for distribution. Author

N78-20163*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY. PART 2, VOLUME 8: SPS LAUNCH VEHICLE ASCENT AND ENTRY SONIC OVERPRESSURE AND NOISE EFFECTS
Dec. 1977 70 p refs
(Contract NAS9-15196)
(NASA-CR-151672; D180-22876-8-Pt-2-Vol-8) Avail: NTIS HC A04/MF A01 CSCL 22B

Recoverable launch vehicle concepts for the Solar Power Satellite program were identified. These large launch vehicles are powered by proposed engines in the F-1 thrust level class. A description of the candidate launch vehicles and their operating mode was provided. Predictions of the sonic over pressures during ascent and entry for both types of vehicles, and prediction of launch noise levels in the vicinity of the launch site were included. An overall assessment and criteria for sonic overpressure and noise levels was examined. Author

N78-20164*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY, PART 3 Final Briefing
7 Mar. 1978 447 p
(Contract NAS9-15196)
(NASA-CR-151673; D180-24071-3-Pt-3) Avail: NTIS HC A19/MF A01 CSCL 22B

A preliminary maintenance analysis was made and system maintenance costs were included. The far sidelobes for the SPS transmitters were studied and demonstration options for the SPS were evaluated. B.B.

N78-20165*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
NASA DART Final Report
Leslie C. Hale 26 Aug. 1977 27 p refs
(Contract NAS6-2826)
(NASA-CR-141436; PSU-IRL-FR-77-3) Avail: NTIS HC A03/MF A01 CSCL 22B

A low cost conductivity probe system for use with the Super Loki Dart meteorological sounding rocket is described. Miniaturization of the Super Arcas blunt probe, operation of the blunt probe experiment, flight tests, and development of a Lyman-alpha probe are among the topics discussed. J.M.S.

N78-20166*# Wisconsin Univ., Madison. Space Science and Engineering Center.
DESIGN AND TESTING OF THE NAVIGATION MODEL FOR THREE AXIS STABILIZED EARTH ORIENTED SATELLITES APPLIED TO THE ATS-6 SATELLITE IMAGE DATA BASE Progress Report, 31 Oct. 1977
W. W. Kuhlow and G. C. Chatters May 1977 63 p
(Contract NAS5-20974)
(NASA-CR-156716) Avail: NTIS HC A04/MF A01 CSCL 22B

An earth edge methodology has been developed to account for the relative attitude changes between successive ATS-6 images which allows reasonable high quality wind sets to be produced. The method consists of measuring the displacements of the right and left infrared earth edges between successive ATS-6 images as a function of scan line; from these measurements the attitude changes can be deduced and used to correct the apparent cloud

displacement measurements. The wind data sets generated from ATS-6 using the earth-edge methodology were compared with those derived from the SMS-1 images (and model) covering the same time period. Quantitative comparisons for low level trade cumuli were made at interpolated uniformly spaced grid points and for selected individual comparison clouds. Selected individual comparison clouds, the root-mean-square differences for the U and V components were 1.0 and 1.2 meters per second with a maximum wind direction difference of 15 deg. Author

N78-20167*# Wisconsin Univ., Madison. Space Science and Engineering Center.
USER MANUAL AND PROGRAMMER REFERENCE MANUAL FOR THE ATS-6 NAVIGATION MODEL AOIPS AND McIDAS VERSIONS, PART 2 Final Report, period ending 31 Dec. 1977
G. C. Chatters and W. W. Kuhlow Dec. 1977 145 p refs
(Contract NAS5-20974)
(NASA-CR-156717) Avail: NTIS HC A07/MF A01 CSCL 22B

Development of a navigation system for a given satellite is reported. An algorithm for converting a satellite picture element location to earth location and vice versa was defined as well as a procedure for measuring the set of constants needed by the algorithm. A user manual briefly describing the current version of the navigation model and how to use the computer programs developed for it is presented. Author

N78-20168*# Aerophysics Research Corp., Bellevue, Wash.
ODIN SYSTEM TECHNOLOGY MODULE LIBRARY, 1972 - 1973 Report Study, Mar. 1971 - Jun. 1972
D. S. Hague, D. A. Watson, C. R. Glatt, R. T. Jones, J. Galipeau, Y. T. Phoa, and R. J. White Mar. 1978 738 p refs
(Contract NAS1-10692)
(NASA-CR-145328) Avail: NTIS HC A99/MF A01 CSCL 22B

ODIN/RLV is a digital computing system for the synthesis and optimization of reusable launch vehicle preliminary designs. The system consists of a library of technology modules in the form of independent computer programs and an executive program, ODINEX, which operates on the technology modules. The technology module library contains programs for estimating all major military flight vehicle system characteristics, for example, geometry, aerodynamics, economics, propulsion, inertia and volumetric properties, trajectories and missions, steady state aeroelasticity and flutter, and stability and control. A general system optimization module, a computer graphics module, and a program precompiler are available as user aids in the ODIN/RLV program technology module library. Author

N78-20169# Saab-Scania, Linkoping (Sweden).
POST FLIGHT REPORT. S19 TEST FLIGHT AT WALLOPS FC, JANUARY 1976
Aug. 1977 86 p refs
(Contract S19-T4251)
(SAAB-RRR-S19-131) Avail: NTIS HC A05/MF A01

The first test flight with the Saab-Scania S19 sounding rocket guidance system took place on 10 Jan. 1976 and was launched with a Black Brant VC rocket from Wallops FC. The post flight report covers conclusions from post flight analysis data; post flight guidance phase simulations; payload integration tests; and campaign test report. For individual titles, see N78-20170 through N78-20173.

N78-20170 Saab-Scania, Linkoping (Sweden).
SOME CONCLUSIONS FROM POSTFLIGHT ANALYSIS OF DATA FROM THE FIRST TEST FLIGHT WITH THE S19 GUIDANCE SYSTEM
Johnny Andersson *In its* Post Flight Rept. S19 Test Flight at Wallops FC, Jan. 1976 Aug. 1977 42 p (For availability see N78-20169 11-15)
(SAAB-RRR-S19-97) Avail: NTIS HC A05/MF A01

The first test flight with the Saab-Scania S19 sounding rocket guidance system took place on 10 Jan. 1976 and was launched from Wallops FC by a Black Brant VC rocket. Conclusions of the Saab-Scania post flight data analysis of TM and radar data are presented. ESA

N78-20171 Saab-Scania, Linkoping (Sweden).
S19 POST FLIGHT GUIDANCE PHASE SIMULATIONS
Lars Ljunge *In its* Post Flight Rept. S19 Test Flight at Wallops FC, Jan. 1976 Aug. 1977 22 p refs (For availability see N78-20169 11-15)
(SAAB-RRSC-S19A-01) Avail: NTIS HC A05/MF A01

The first test flight of the Saab-Scania S19 sounding rocket guidance system took place on 10 Jan. 1976 and was launched from Wallops FC by a Black Brant VC rocket. The methods for evaluating system parameters used in the post flight analysis are outlined and closed and open loop simulators are discussed. Turbulence effects causing ripples in signals and wind profile variations accounting for the difference in impact point prediction, are described. ESA

N78-20172 Saab-Scania, Linkoping (Sweden).
INTEGRATION TEST PAYLOAD S19
Torbjoern Forsell *In its* Post Flight Rept. S19 Test Flight at Wallops FC, Jan. 1976 Aug. 1977 6 p (For availability see N78-20169 11-15)
(SAAB-RRKR-S19-434) Avail: NTIS HC A05/MF A01

Integration tests on the S19 instrumentation bay-guidance module, gyro platform and autopilot are analyzed. Tests included function tests, bend, vibration and spin tests. ESA

N78-20173 Saab-Scania, Linkoping (Sweden).
GUIDANCE SYSTEM S19. CAMPAIGN TEST REPORT
Torbjoern Forsell *In its* Post Flight Rept. S19 Test Flight at Wallops FC, Jan. 1976 Aug. 1977 14 p (For availability see N78-20169 11-15)
(SAAB-RRKR-S19-435) Avail: NTIS HC A05/MF A01

The first test flight with the Saab-Scania S19 sounding rocket guidance system took place on 10 Jan. 1976 and was launched from Wallops FC by a Black Brant VC rocket. Function tests on the module and payload are described together with electrical and mechanical preflight checks. The launching phase from arming to countdown is also given together with test results. ESA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N78-20174*# Martin Marietta Aerospace, Denver, Colo.
ORBITER/PAYLOAD CONTAMINATION CONTROL ASSESSMENT SUPPORT Final Report
R. O. Rantanen, D. A. Strange, and M. A. Hetrick 1 Feb. 1978 110 p refs
(Contract NAS9-14767)
(NASA-CR-151654; MCR-78-517) Avail: NTIS HC A06/MF A01 CSCL 22B

The development and integration of 16 payload bay liner filters into the existing shuttle/payload contamination evaluation (SPACE) computer program is discussed as well as an initial mission profile model. As part of the mission profile model, a thermal conversion program, a temperature cycling routine, a flexible plot routine and a mission simulation of orbital flight test 3 are presented. Author

N78-20175*# Hamilton Standard, Windsor Locks, Conn.
SHUTTLE ENVIRONMENTAL AND THERMAL CONTROL/LIFE SUPPORT SYSTEM COMPUTER PROGRAM Final Report
Ernest E. Smith, Jr. Feb. 1978 83 p refs
(Contract NAS9-14913)
(NASA-CR-151661) Avail: NTIS HC A05/MF A01 CSCL 06K

Users guide describes the computer programs developed to aid in the analysis of RSECS (Representative Shuttle Environmental Control System) related material. These programs were prepared to provide pretest predictions, post test analysis, and real time problem analysis for RSECS related test planning and evaluation.The programs were designed for use on a Wang 2200 series computer system. Author

N78-20176*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STATIC AND DYNAMIC STABILITY ANALYSIS OF THE SPACE SHUTTLE VEHICLE-ORBITER
Wei J. Chyu, Ralph K. Cavin (Texas A and M Univ., College Station), and Larry L. Erickson Mar. 1978 62 p refs
(NASA-TP-1179; A-7217) Avail: NTIS HC A04/MF A01 CSCL 22B

The longitudinal static and dynamic stability of a Space Shuttle Vehicle-Orbiter (SSV Orbiter) model is analyzed using the FLEXSTAB computer program. Nonlinear effects are accounted for by application of a correction technique in the FLEXSTAB system; the technique incorporates experimental force and pressure data into the linear aerodynamic theory. A flexible Orbiter model is treated in the static stability analysis for the flight conditions of Mach number 0.9 for rectilinear flight (1 g) and for a pull-up maneuver (2.5 g) at an altitude of 15.24 km. Static stability parameters and structural deformations of the Orbiter are calculated at trim conditions for the dynamic stability analysis, and the characteristics of damping in pitch are investigated for a Mach number range of 0.3 to 1.2. The calculated results for both the static and dynamic stabilities are compared with the available experimental data. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N78-20177*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A HIGHLY ACCURATE METHOD FOR THE DETERMINATION OF MASS AND CENTER OF MASS OF A SPACECRAFT
E. Y. Chow, M. R. Trubert, and A. Egwuatu 15 Apr. 1978 63 p
(Contract NAS7-100)
(NASA-CR-156130; JPL-Pub-78-2) Avail: NTIS HC A04/MF A01 CSCL 22B

An extremely accurate method for the measurement of mass and the lateral center of mass of a spacecraft has been developed. The method was needed for the Voyager spacecraft mission requirement which limited the uncertainty in the knowledge of lateral center of mass of the spacecraft system weighing 750 kg to be less than 1.0 mm (0.04 in.). The method consists of using three load cells symmetrically located at 120 deg apart on a turntable with respect to the vertical axis of the spacecraft and making six measurements for each load cell. These six measurements are taken by cyclic rotations of the load cell turntable and of the spacecraft, about the vertical axis of the measurement fixture. This method eliminates all alignment, leveling, and load cell calibration errors for the lateral center of mass determination, and permits a statistical best fit of the measurement data. An associated data reduction computer program called MASCM has been written to implement this method and has been used for the Voyager spacecraft. Author

N78-20178# European Space Agency, Paris (France).
ATTITUDE CONTROL OF SPACE VEHICLES: TECHNOLOGICAL AND DYNAMICAL PROBLEMS ASSOCIATED WITH THE PRESENCE OF LIQUIDS
J. L. Cendral, ed., J. L. Marce, ed., and T. D. Guyenne, ed. Dec. 1977 218 p refs Partly in ENGLISH; partly in FRENCH Proc. of Intern. Conf. held at Toulouse, 10-12 Oct. 1977; co-sponsored by CNES
(ESA-SP-129) Avail: NTIS HC A10/MF A01

The dynamic aspects of fluid satellite interaction were discussed, the two main themes being the influence of the presence of fluids on both controlled and uncontrolled satellite motions, and the effect of satellite motions on the management of the fluids and the possible perturbation of their functions. The five sessions and the round table discussions were devoted respectively to: satellite propulsion-system tanks (particularly capillary and positive-expulsion tanks); spin dynamics; three-axis dynamics; stability; liquid nutation dampers. For individual titles, see N78-20179 through N78-20197.

N78-20179 European Space Research and Technology Center, Noordwijk (Netherlands). Attitude and Orbit Control Div.
ESA'S ACTIVITIES IN THE FIELDS OF DYNAMICS AND TECHNOLOGY RELATED TO THE PRESENCE OF LIQUIDS ON-BOARD SPACECRAFT
J. L. Cendral and W. Berry *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 9-21 refs (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

The presence of significant amounts of liquids onboard spacecraft raises problems in two areas: the design of the containers for effective management of the liquids in the presence of satellite motion, and the dynamic interaction between liquid and satellite motion with consequent design impacts on the attitude control systems. ESA's past and current activities in these domains are presented. In particular, the experience on the dynamics of unstable spinning satellites, liquid type nutation dampers, and bipropellant apogee boost motors are discussed. The Agency's activities in the development of positive expulsion and surface tension propellant tanks to be used for three axis stabilized missions are summarized. Future aspects of the problems as they appear to be modified by technological trends and new developments for future spacecraft are discussed.
Author (ESA)

N78-20180 Centre National d'Etudes Spatiales, Toulouse (France).
THE BEHAVIOR OF LIQUIDS IN SPACE VEHICLES: THE CNES PROGRAM SINCE 1971 [LE PROGRAMME DU CNES DEPUIS 1971 SUR LE COMPORTEMENT DES LIQUIDES DANS LES VEHICULES SPATIAUX]
J. L. Marce, P. Duchon, and L. Torres *In* ESA Attitude Control of Space Vehicles: Technol and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 23-29 refs In FRENCH (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

The CNES program on problems connected with the presence of liquids onboard space vehicles is presented. The necessity of studying such problems became clear in 1971 on the occasion of the D5A project and the preliminary study of Meteosat. Two major types of problems are recalled: the behavior of rotating liquids and the behavior of liquids at reduced gravity. The different theoretical and experimental studies developed under the responsibility of CNES to solve these problems are discussed. In particular the rotating air bearing developed to study the energy dissipation in rotating liquids is described. The future program of CNES in this area is presented. ESA

N78-20181 National Aerospace Lab., Amsterdam (Netherlands).
CONTAINED-LIQUID EXPERIMENTS ON SPACELAB 1
J. P. B. Vreeburg *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 31-37 refs Sponsored by Neth. Agency for Aerospace Programs (NIVR) (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

Some experiments with partially filled liquid containers proposed by the NLR are scheduled for execution on the first flight of Spacelab. The relevance of these experiments to spacecraft attitude control is pointed out. Various considerations that relate to the design of the experiments are discussed and clarified with references to literature. Past and planned preparatory experiments and tests are presented. Author (ESA)

N78-20182 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

FABRICATION EXPERIENCE FOR SPACECRAFT PROPELLANT TANKS

M. A. Schwende and G. Tybus *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 39-44 (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

The fabrication of the propellant tanks for the apogee boost motor and for the orbit control system in the Symphonie Program is discussed. The apogee boost motor required the storage of He under high pressure (400 bar) in a simple small sphere, the storage of the two propellants N2O4 and AZ5O in a common tank with intermediate bulkhead, whereas the orbit control system had to store N2 and the two propellants. A bellow system was chosen for the separation of gas and liquid and for the application in spinning and nonspinning phases. A short overview on further fabrication technologies and on the preferred applications is given. Author (ESA)

N78-20183 Societe Europeene de Propulsion, Vernon (France).

SURFACE TENSION TANKS FOR A THREE AXIS STABILIZED SATELLITE [RESERVOIRS A TENSION SUPERFICIELLE POUR SATELLITE STABILISE 3 AXES]

M. Robert *In* ESA Attitude Control of Space Vehicles; Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 45-48 In FRENCH (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

The design and functioning of two types of surface tension tanks, that can be used in three axis stabilized satellites, is discussed. The main characteristic of such a tank is that the mass center can be controlled under certain environmental acceleration conditions. The first tank, called RETS 18, contains a capillary system consisting of an equatorial collector protected all along its perimeter by a gas layer and of two conical baffles resting on the collector and destined to retain the liquid in a stable way in the immediate neighborhood of the collector. The second tank, to be used in future European communications satellites, contains channels along the wall of the tank, connected to a gas trap at the liquid end of the tank. The symmetry axis of the tank is inclined to the satellite spin axis so that the liquid exit remains immersed during launch and orbital transfer. ESA

N78-20184 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

PROBLEMS OF CONTAINED ROTATING FLUIDS WITH RESPECT TO AEROSPACE APPLICATIONS

F. Pfeiffer *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 51-62 refs (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

Contained rotating fluid problems are surveyed. Some fields of application, various methods of solution, and some still open questions are discussed. Main emphasis is laid on space application and on the activities of MBB in this field: stability theory by Rumyantsev; ellipsoid homogeneous vortex motion; solution by the Galerkin method; homogeneous vortex approximation for general tank configurations. A comparison of the various methods of solution presents the main advantages and disadvantages of each method. The present good level of confidence in applying existing theories to technical problems is demonstrated by a corresponding list of arguments. Author (ESA)

N78-20185 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

THEORETICAL AND EXPERIMENTAL STUDY OF THE DYNAMICS OF A SPINNING SATELLITE WITH TOROIDAL TANK

M. Dokhac, J. Fave, J. P. Guibert, and J. L. Marce (CNES) *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 63-76 refs In FRENCH; ENGLISH summary (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

The stability of the nutation motion of a satellite with a toroidal tank containing a liquid, coaxial with the spinning satellite, was studied by a modal representation of the liquid motions. These comprise free surface motions and internal motions. The energy dissipation is accounted for by means of a laminar boundary layer associated with each mode. The instability zone obtained by retaining the first modes agrees well with the limit defined by the Rumyantsev criterion. It is also shown that there exists a very strong dynamic instability zone, due to the vicinity of the frequencies associated to two degrees of freedom. An experimental study on air bearing complements the results obtained. Author (ESA)

N78-20186* Martin Marietta Aerospace, Denver, Colo.

FLUID INTERACTION WITH SPINNING TOROIDAL TANKS

D. A. Fester and J. E. Anderson *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 77-86 refs (For availability see N78-20178 11-18)

(Contract NAS2-7489)

Avail: NTIS HC A10/MF A01 CSCL 22B

An experimental study was conducted to evaluate propellant behavior in spinning torroidal tanks that could be used in a retropropulsion system of an advanced outer-planet Pioneer orbiter. Information on propellant slosh and settling and on ullage orientation and stability was obtained. The effects of axial acceleration, spin rate, spin-rate change, and spacecraft wobble, both singly and in combination, were evaluated using a one-eighth scale transparent tank in one-g and low-g environments. Liquid loadings ranged from 5% to 96% full. The impact of a surface tension acquisition device was assessed by comparison with bare-tank results. The testing simulated the behavior of the fluorine/hydrazine and nitrogen textroxide/monomethylhydrazine propellants. Results are presented that indicate that no major fluid behavior problems would be encountered with any of the four propellants in the toroidal tanks of a spin-stabilized orbiter spacecraft. Author (ESA)

N78-20187 Communications Satellite Corp., Washington, D.C.

INTELSAT 4 IN-ORBIT LIQUID SLOSH TESTS AND PROBLEMS IN THE THEORETICAL ANALYSIS OF THE DATA

V. J. Slabinski *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 87-102 refs (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

Intelsat 4 liquid slosh tests are presented. Each Intelsat 4 dual spin spacecraft has four conisphere propellant tanks containing liquid hydrazine mounted on the spinning rotor section. The destabilizing effect of the liquid on attitude-nutation stability was determined from an extensive series of in-orbit tests. The liquid slosh driving frequency ratio (rotor nutation frequency/rotor spin rate) was varied over the range from 0.58 to 0.70 for the tests by rotating the spacecraft antenna platform at different rates in inertial space. A rotor mounted accelerometer sensed the spacecraft nutation. The observed time constant for the nutation angle increase or decrease was corrected for the stabilizing contribution of the platform mounted pendulum dampers to yield the net destabilizing dedamping contribution from the liquid slosh. The in-orbit tests show two unexpected maxima in the dedamping contribution at driving frequency ratios that vary with the propellant loading. The rotor nutation frequency at the maxima is appr. 1/3 the lowest mode liquid slosh frequency given by ground test data for unspun tanks, and thus does not correspond to a simple resonance of the liquid. Ground tests with spinning systems have produced the same maxima but the phenomenon is not yet understood. Author (ESA)

N78-20188 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
VARIATIONAL FORMULATIONS OF HYDROCAPILLARY VIBRATION PROBLEMS. RESULTS OBTAINED WITH THE FINITE ELEMENT METHOD
H. Morand and R. Hayon *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 105-119 refs In FRENCH; ENGLISH summary Sponsored in part by CNES (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

Various symmetric mixed variational formulations of the hydro-capillary vibrations problem are established. They lead directly to a numerical treatment by a mixed finite element method. The formulations presented are quite capable of taking into account the various kinematic conditions imposed at the meniscus edge. Numerical results are shown on test configurations for static and dynamic configurations. The results obtained show the validity and the efficiency of the proposed methods. Author (ESA)

N78-20189 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
TWO CONGRUENCE THEOREMS FOR THE VIBRATIONS OF LIQUIDS COUPLED WITH STRUCTURES
H. Morand *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 121-130 refs In FRENCH; ENGLISH summary (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

Congruence theorems for the vibration of a liquid under capillary tension and uniform acceleration contained in a rigid (satellite) tank and for the hydroelastic vibrations of a flexible tank containing a liquid were derived. It is proven that the nth hydrocapillary natural frequency of a liquid contained in a satellite is a lower bound for the nth frequency corresponding to a configuration with the same free surface but with a liquid domain including the preceding one. It is shown that the hydroelastic natural frequencies of an elastic tank containing a liquid are a decreasing function of the filling ratio. The extremum properties of the added mass operators involved in the above studies are set up and it is proven that the numerical approximations of the natural frequencies resulting from the discretization of a mixed finite element formulation are upper bounds for the exact eigenfrequencies. Author (ESA)

N78-20190 Rome Univ. (Italy). Inst. of Aerospace Technology.
STABILITY OF ORBITING SPACECRAFT IN PRESENCE OF LIQUIDS
P. Santini and R. Barboni *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 131-139 refs (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

The dynamic behavior of a satellite, consisting of a rigid structure with cavities with a sloshing fluid, was studied. The fluid motion is described for each cavity, via sloshing modes; furthermore, rigid motion parameters are introduced. Solving equations include free surface conditions and dynamic equations, in translation and rotation. A discussion on sloshing modes is presented. Numerical examples are given. Author (ESA)

N78-20191 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
STABILITY PROBLEMS OF A LIQUID PROPELLANT APOGEE MOTOR
R. Metzger *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 143-155 refs (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

Aspects of the stability of liquid propellant apogee boost motors are discussed. For injection from transfer orbit into geostationary orbit a motor with liquid propellants offers some pronounced advantages over a solid propellant motor. The main shortcoming of a liquid motor is the stability problem arising from the liquid masses in the propellant tanks. Following Rumyantsev stability, criteria for spin-stabilized satellites with liquid propellants are formulated for arbitrary tank configurations and arbitrary spin rates and thrust levels. Methods for the calculation of attitude time histories are sketched shortly. Numerical results are given for some configurations that can be taken as representative for possible Ariane satellites.
Author (ESA)

N78-20192 Societe Europeene de Propulsion, Vernon (France).
DYNAMICS OF SPINNING SPACECRAFT CONTAINING VARIOUS REVOLVING FILLED ECCENTRIC TANKS [DYNAMIQUE D'UN VEHICULE SPATIAL CONTENANT PLUSIEURS RESERVOIRS DE REVOLUTION PLEINS EXCENTRES EN AUTOROTATION]
A. deBerranger *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 157-163 refs In FRENCH (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

The influence of the eccentricity of revolving tanks that are completely filled on the stability of spinning spacecraft was analyzed. Both for ideal and for viscous liquids the problem was reduced to the classical case of the single central tank. In the nonviscous case the equations describing the dynamics of the total system were derived from the free inertial liquid modes occurring when the nutation of the vehicle is blocked. Remarkable properties resulting from the mathematical structure of the system and from its coefficients were shown. The results were verified whenever possible using the spherical tank. ESA

N78-20193 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STABILITY CRITERION FOR THE PRECESSIONAL MOTION OF A NON-RIGID SPACECRAFT. APPLICATION TO CONTAINED LIQUIDS
J. P. Guibert *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 165-175 refs In FRENCH; ENGLISH summary (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

To ensure natural stability of the precession motion of a deformable satellite, it is necessary that the difference between the axial and transverse inertias reaches a given value, which is a function of the mass and position of deformable elements. This difference is given by the Rumyantsev criterion; to this criterion corresponds an inertia ratio that separates the stable and unstable domains. The limit is presented in detail. It is shown that it does not depend on internal dissipation and that it can be obtained without any modelling of the relative velocities of deformable elements. It is also shown that the Rumyantsev criterion permits the validation of the modal decomposition of the deformation. Applications to liquid-containing satellites are discussed. The important parameters are brought to light, as well as the partitioning effect and the communication between tanks. Author (ESA)

N78-20194 Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
ASYMMETRIC OSCILLATION OF A PASSIVE NUTATION DAMPER
L. J. Ancher, H. VandenBrink, and A. Pouw *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 179-183 (For availability see N78-20178 11-18)
Avail: NTIS HC A10/MF A01

The performance of a nutation damper can be calculated approximately with the 'energy sink' method which is briefly described. The dampers treated are the equatorial outwards pendulum damper, the annular damper with offset, and the equatorial tube-with-endpots damper. The energy sink analysis shows that the damper mass performs a harmonic oscillation about a given zero position. The coupled equations of motion however result in an asymmetric oscillation about the zero position. This is the case with the pendulum damper, for which it can cause a serious performance degradation, with the annular damper with offset and to a much lower level also with the tube with endpots damper. Author (ESA)

N78-20195 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

INVESTIGATIONS OF ANNULAR DAMPERS FOR SPINNING SPACE VEHICLES

L. Schmieder *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 185-192 refs (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

Calculations on annular dampers for use on spinning satellites are presented. Annular tubes half-filled with mercury and mounted parallel to the equator-plane of a gyroscope, effect a rapid decrease of the nutation, although the mass of the mercury is only a thousandth part of the gyroscope. Simple formulas are given for the calculation of the 'transition angle' and the damping effect. The transition angle separates the nutation synchronous mode from the spinning synchronous mode. In the first mode the damping effect is very high, in the second mode it is low. Author (ESA)

N78-20196 Naval Research Lab., Washington, D. C. Space Systems Div.

GRAVITY EFFECTS IN THE TESTING OF NUTATION DAMPERS

K. T. Alfriend *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 193-197 refs (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

A method was developed for determining the effect of gravity on the nutation time constant of spinning spacecraft during testing. It is shown both by analyses and test results that gravity can have a substantial effect for some nutation dampers. The method was applied to four dampers, two fluid type dampers and two spring-mass-dashpot type dampers. In each type gravity had a substantial effect on one damper and no effect on the other. A comparison with test results for the partially filled viscous ring damper is given. For this damper it was shown that gravity does not affect the time constant in the nutation-synchronous mode but that it can have a significant effect on the time constant for the spin-synchronous mode. Author (ESA)

N78-20197 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

GROUND BASED EQUIPMENT FOR THE EVALUATION OF THE OPERATIONAL CHARACTERISTICS OF A NUTATION DAMPER [DISPOSITIF D'EVALUATION AU SOL DES CARACTERISTIQUES FONCTIONNELLES D'UN AMORTISSEUR DE NUTATION]

S. Larigaldie, J. L. Boulay, and R. Juillerat *In* ESA Attitude Control of Space Vehicles: Technol. and Dyn. Probl. Assoc. with the Presence of Liquids Dec. 1977 p 199-206 refs In FRENCH (For availability see N78-20178 11-18)

Avail: NTIS HC A10/MF A01

The performance of a nutation damper with a very low operational threshold, to be used in the spin stabilized Meteosat, was determined experimentally. The method consists of measuring the power necessary to produce in the damper an oscillatory movement with given amplitude and frequency. The test equipment has permitted the determination of the expected in-flight performance of the nutation damper from measurements on the ground; the damper will operate at 11 g onboard the satellite. The validity of the method was confirmed by a test performed by CNES on a NASA centrifuge. ESA

N78-20198# European Space Agency, Paris (France).

ATTITUDE AND ORBIT CONTROL SYSTEMS

C. Rowley, ed. and B. Battrick, ed. Nov. 1977 569 p refs Partly in ENGLISH and partly in FRENCH Proc. of a Conf. held at Noordwijk, Neth., 3-6 Oct. 1977

(ESA-SP-128) Avail: NTIS HC A24/MF A01

Papers presented at the first international conference on Attitude and Orbit Control Systems (AOCS) organized by ESTEC, held in Noordwijk, The Netherlands, from 3-6 October 1977 are discussed. The conference was divided into 8 sessions, dealing respectively with attitude and orbit control systems, attitude measurement and control techniques, orbit injection and control, dynamics and control theory, implementation and test methods, optical sensors, rotating actuators, chemical propulsion, and electric propulsion. The papers report mainly on the state of the art, current applications, and possible future applications of the technologies reviewed. The short panel discussions held at the end of each session are not included in these proceedings; however, where expedient, authors incorporated answers to/comments on individual questions at the end of their papers. For individual titles, see N78-20199 through N78-20249.

N78-20199# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

THE ATTITUDE DETERMINATION AND CONTROL SUBSYSTEM OF THE INTELSAT 5 SPACECRAFT

H. Bittner, E. Bruederle, C. Roche, and W. Schmidts *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 1-20 (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The attitude determination and control subsystem of the Intelsat 5 spacecraft, presently under development at Messerschmitt-Bolkow-Blohm Company are dealt with. A detailed discussion of the control system design concepts by means of transfer function block diagrams for all mission phases from acquisition up to normal on orbit modes of operation is given. System performance figures obtained from sensitivity analyses as compared to specified requirements are summarized in synoptic tables, essential control problem areas are outlined, and representative simulation results are shown. Author (ESA)

N78-20200# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.

IRAS ATTITUDE CONTROL SUBSYSTEM

R. W. H. vanBezooyen *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 21-27 (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

Following a survey of the IRAS Attitude Control Subsystem (ACS) requirements as imposed by the scientific experiments, the attitude control system concept is elaborated. Sensors, actuators, and onboard computer, which are prime elements in the answer to the scientific purpose of the mission, as well as their mutual relations are described. Very characteristic is the flexibility of the attitude control system. Due to the application of an onboard computer a number of procedures is possible. Phases needed before starting the measurements, different measurement modes, calibrations, eclipse handling, health checks, experiment protection against heat inputs from sun and earth, back-ups in case of failures; they are all easily handled by the onboard computer. Author (ESA)

N78-20201# Engins Matra, Velizy (France). Space Div.

APPLICATION OF A ONE DEGREE OF TRANSVERSE FREEDOM SYSTEM TO THE ATTITUDE CONTROL OF AN OPERATIONAL ARIANE LARGE SATELLITE

J. Broquet and B. Govin *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 29-36 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

From a brief introduction on the candidate attitude control systems for geostationary satellite requiring a very high pointing accuracy, the application of a one degree of transverse freedom system, using magnetic bearing momentum wheels, radio frequency sensor, programmable control electronics and magnetic coils, to an operational Ariane Large Satellite, is presented with special emphasis on the system capability in terms of accuracy. The optimization of the system for normal mode, stationkeeping mode, and reacquisition operation is described in some detail for the case of a 1.5 kW satellite. Typical results of simulation are shown for the operational phase. Author (ESA)

N78-20202# British Aircraft Corp. (Operating) Ltd., Bristol (England).

A SURVEY OF EARTH SURFACE OBSERVATION SATELLITES AND THE INTERFACE BETWEEN REMOTE SENSOR AND ATTITUDE CONTROL SYSTEM

M. J. Hammond *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 37-51 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

A brief survey of earth observation satellites is presented including possible future developments. Consideration is given

to the flow of information from remote sensor to user and the areas where satellite attitude measurement and control directly impact on reconstruction of the original scene. An overview of the performance specification and implementation of candidate systems is presented which is concluded by an assessment of a common bus' philosophy related to various system options.
Author (ESA)

N78-20203# Hawker Siddeley Dynamics Ltd., Stevenage (England). Space Div.
A PRELIMINARY STUDY OF ATTITUDE MEASUREMENT AND CONTROL REQUIREMENTS FOR EARTH RESOURCES SATELLITES
M. Burton, J. B. Farrow, and P. J. Elkins *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 53-60 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

Some results relating to attitude measurements and control requirements for Earth Resources Satellites are presented. Major study objectives are to relate, in a quantitative manner, the attitude and orbital motions and measurements of these motions, to the quality of the remote sensor output. To achieve these objectives a FORTRAN computer simulation was developed consisting of models of: (1) remote sensors and output quality criteria; (2) satellite dynamics and kinematics; (3) orbital motion and landmarks; (4) attitude sensors. The simulation contains a number of options for each of the above four models and allows any combination (of remote sensor, satellite, orbit and attitude sensor) to be analyzed. Author (ESA)

N78-20204# British Aircraft Corp. (Operating) Ltd., Bristol (England).
GEOS ATTITUDE AND ORBIT CONTROL SUB-SYSTEM
L. Virdee and J. Pope *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 61-75 (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The attitude and orbit control subsystem developed in Europe for GEOS, the first geostationary scientific satellite produced for the European Space Agency is described. The mission requirements imposed on the subsystem are presented and its constituent elements are described, with particular reference to the Reaction Control Equipment (RCE), its design, its development, and its ground servicing and checkout program through to launch. A summary of the significant inflight data analysis so far performed is given. Author (ESA)

N78-20205# Hawker Siddeley Dynamics Ltd., Stevenage (England). Space Div.
ATTITUDE CONTROL AND STABILISATION OF PASSIVE ATMOSPHERIC SOUNDERS ON SPACELAB
J. B. Farrow and M. Burton *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 77-85 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

Results are presented from ESA-funded studies into the Attitude Control and Stabilization (ACS) of passive atmospheric sounders on Spacelab. ACS requirements for vertical sounders are relaxed compared to limb sounders, but the latter provide distinct advantages (measurement sensitivity, vertical resolution). A common attitude pointing system is described which could satisfy the ACS requirements of passive sounders. Physical characteristics are detailed. Performance error budgets and control loop simulation results are presented. Author (ESA)

N78-20206# British Aircraft Corp. (Operating) Ltd., Bristol (England).
A PARAMETRIC STUDY INTO STRUCTURAL FLEXIBILITY. SATELLITE ATTITUDE INTERACTION FOR A THREE-AXIS STABILISED SATELLITE
R. S. Harris *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 89-101 refs (For availability see N78-20198 11-18) (Contract ESTEC-2312/74-AK)
Avail: NTIS HC A24/MF A01

The flexure-satellite attitude interaction due to two uniform beam appendages on a three axis stabilized spacecraft are examined. Three basic actuator devices are considered - reaction wheels, a double gimballed momentum wheel (DGMW) using linear gimbal servo loops and a single gimballed momentum wheel (SGMW), gimballed about the roll axis, with either a linear or a stepper motor gimbal drive. Results of parametric studies are presented, demonstrating how the interaction is a function of the actuator type, the control law, the satellite size, the sensor characteristics and the appendage modal gains, frequencies and structural damping, all of which have a heavy impact on the system stability. Author (ESA)

N78-20207# Engins Matra, Velizy (France).
MAGNETOTORQUING FOR THE ATTITUDE CONTROL OF GEOSTATIONARY SATELLITES
J. L. Lacombe *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 103-110 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The feasability of a torquing system using the possibilities offered by the geomagnetic field is investigated. The characteristics of this field are shortly remembered at geostationary station. The implementation of a magnetotorquer system onboard of an Ariane launched heavy long life satellite is analyzed; the magnetotorquing concept is applied then to the case of 1 DOF (one degree of freedom) angular momentum type of control and concerns mainly the yaw control during normal operation. Performances of both open loop and closed loop controls are established and various magnetotorquer configurations are presented. The development of the magnetotorquer equipment is studied under the form of air-cored and magnetic-cored coils. A final synthesis and discussion emphasizes advantages and potential improvements brought by the magnetotorquing.
Author (ESA)

N78-20208# Naval Research Lab., Washington, D. C. Space Systems Div.
GEOMAGNETIC FIELD EFFECTS ON THE DESIGN OF MAGNETIC ATTITUDE CONTROL SYSTEM
K. T. Alfriend and R. E. Lindberg, Jr. *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 111-121 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The effect of the geomagnetic field model on the performance of an autonomous dual spin satellite attitude control system that utilizes the interaction of the geomagnetic field and a satellite dipole parallel to the spin axis is evaluated. The control law utilizes the rate of change of the magnetic field along the spin axis to control nutation and the roll axis component of the magnetic field to change the direction of the momentum vector. Approximate solutions for the time constants or feedback gains are obtained. Comparison with numerical results show good agreement. Author (ESA)

N78-20209# Centre National d'Etudes Spatiales, Toulouse (France).
ORBITAL FUNCTIONING OF THE D5A SATELLITE ATTITUDE CONTROL SYSTEM [FONCTIONNEMENT EN ORBITE DU SYSTEME DE MESURE D'ATTITUDE DU SATELLITE D5A]
J. L. Marce and J. J. Runavot *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 123-130 refs In FRENCH (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The various sensors of the D5A French satellite attitude control system are described with emphasis on the inertial detectors. The pre-flight tests carried out are presented. Results obtained during the three-month orbital life of the satellite are discussed and compared to those predicted. Some conclusions are drawn on the orbital behavior of the inertial measuring system relating to the thrustor operation, to the external perturbing effects acting on the satellite, and to hydrazine motion in the propellant tank with capillary retention. ESA

N78-20210# Royal Aircraft Establishment, Farnborough (England).
SYSTEM STUDY OF AN INERTIAL ATTITUDE-MEASUREMENT SYSTEM FOR EARTHPOINTING SATELLITES
R. J. Jude *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 131-144 refs (For availability see N78-20198 11-18)

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An attitude-measurement system is described for satellites requiring high precision in earth pointing. The system is based on a strapdown set of rate-integrating gyroscopes and is updated by attitude and gyro drift estimates produced, via an on-board Kalman filter algorithm, from intermittent star measurements made by novel slit star sensors. A description of the system components is given and the development of the Kalman filter outlined. Results from digital computer simulations of the system performance are presented showing the RMS total attitude errors (excluding biases) when 14 updates per orbit are made to be 6 seconds of arc for a satellite in a 766 km high orbit. The simulations show the performance to be relatively insensitive to the number of updates per orbit and to overestimation of the modelled star-sensor noise in the Kalman filter. A proposed laboratory demonstration model of the system is described. Author (ESA)

N78-20211# National Aerospace Lab., Amsterdam (Netherlands).
ATTITUDE RECONSTITUTION FOR SPINNING SPACECRAFT WITH THE ESA STAR MAPPER

P. T. L. M. vanWoerkom and C. R. Traas *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 145-149 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The ESA starmapper is an optical-electronic instrument, attached to a spinning spacecraft, and equipped with eight slits, each marking the times of passage of stars. The telemetered times of passage are fed into a linear, recursive, minimum variance, extended, square root, adaptive filter, in order to obtain an accurate reconstitution of the spacecraft attitude and system parameters. A brief outline is presented of the mathematical modelling of spacecraft spin dynamics and star mapper, and of the formulation of the filter. Computer simulations were carried out to investigate how accurately spacecraft attitude and certain spacecraft parameters (inertia's, misalignments, external torques) can be reconstituted from given simulated star passage times. The simulations indicate the usefulness of the square root formulation of the filter, and of its adaptive mechanism. For small nutation angles of the spinning spacecraft, the attitude motion can be reconstituted with an accuracy of about one arcminute. As the nutation angle increases, this accuracy decreases and divergence may result. Divergence may be delayed if measurement noise is increased. Spacecraft parameters could not be estimated accurately; therefore, they were modelled and 'consider' parameters to enhance attitude reconstitution accuracy. Author (ESA)

N78-20212# European Space Research and Technology Center, Noordwijk (Netherlands).
AN AUTONOMOUS SYSTEM FOR ORBIT INJECTION

L. M. Palenzona *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 153-167 (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

Solid propellant rocket motors for space applications are being developed by the European Space Agency within a consortium of European industries. There are motors of different sizes which constitute the MAGE (European Geostationary Apogee Motor) family. The use of the three-stage Ariane vehicle to launch the Exosat spacecraft requires a supplementary propulsion unit to inject the satellite into its final orbit. In early 1976, the idea came to investigate the possibility of using one motor out of the MAGE family as the basic booster of the propulsion unit. The conceptual design of a propulsion system of this type is presented in order to discuss the design and interface requirements, and to identify possible utilizations for future space missions. Author (ESA)

N78-20213# Centre National d'Etudes Spatiales, Toulouse (France).
NON-NOMINAL UTILIZATION OF AN ATTITUDE AND ORBIT CONTROL SYSTEM: APPLICATION TO SYMPHONIE [UTILISATION NON NOMINALE D'UN SYSTEME DE CONTROLE D'ATTITUDE ET D'ORBITE: APPLICATION A SYMPHONIE]

J. M. Robert and M. Burello *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 169-176 In FRENCH (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The method and in-flight results of a non-nominal piloting mode for use on the Symphonie satellite for longitudinal drift and pitch corrections are presented. Implementation of this method was decided on as a result of an equipment failure of the stabilization system (steering jets blocked in open position). The functioning mode demonstrated the importance of retaining, on piloted satellites, the possibility of manual commands for various attitude and orbit corrections, thus ensuring the continuance of the satellite's mission even when a stabilization subsystem failure makes the use of an automatic pilot impossible. ESA

N78-20214# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
ORBIT DETERMINATION ERROR ANALYSIS THROUGH SATELLITE-SATELLITE SYSTEMS

A. Leibold and C. K. Rajasingh (ISRO Satellite Centre) *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 177-191 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

A statistical orbit determination error analysis assuming least squares estimation is performed for various types of satellite missions. Doppler data and two-way range signals from a main station via a geostationary relay station to a user satellite and back are evaluated. The same missions are investigated employing conventional ground stations, only. The TDRSS of NASA and the future ground station network of ESA is used, respectively. Reasonable error assumptions are made. It is shown that with one tracking relay satellite the same orbit determination accuracies can be obtained as they are achieved with the ground station network. Additionally, the problem of subsatellite tracking from Spacelab is investigated. It is found that accuracies from 50 to 100 m for the relative position of the subsatellite with respect to Spacelab can be obtained. Author (ESA)

N78-20215# European Space Operations Center, Darmstadt (West Germany).
OPTIMAL ORBIT CONTROL FOR STATION KEEPING WITHIN THE MULTISATELLITE SUPPORT SYSTEM (MSSS)

J. J. Martinez *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 193-199 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The fundamental expression and algorithms used on the determination of optimal east-west station keeping maneuver within the multisatellite support system developed at ESOC are presented. The optimization index and variables considered are the times between corrections and the values of initial eccentricity, drift velocity, and argument of perigee to be obtained immediately after the maneuver. Two different types of simplified solutions are presented corresponding to corrections with one and two impulses respectively. In both cases, special attention was given to correct adequately the effects of the solar radiation pressure. Author (ESA)

N78-20216# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
EIGENVALUE ANALYSIS OF THE NON-RIGID THREE-AXIS CONTROLLED GIMBAL-SYSTEM FOR THE HARD-MOUNTED SPACELAB INSTRUMENT POINTING SUB-SYSTEM

B. Koesters *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 201-208 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The derivation of high-order linearized system-equations of a new kind of a 3-axis controlled gimbal system is presented. The special feature of this design is a so called inside-out configuration where the center of mass of the instrument is located with high distance from the center of rotation. A model regarding four bodies of interest, i.e. the orbiter, the gimbal-yoke, the inner-gimbal, and the instrument, is set up and the equations of motion are derived. Eigenvalue-analysis of the linearized, time-independent model is performed and some aspects of hardware design, i.e. bearing stiffness and geometric relations are presented. Author (ESA)

N78-20217# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.
A MULTIBODY EULERIAN DYNAMIC SIMULATION AS A DESIGN TOOL FOR ATTITUDE DYNAMICS AND CONTROL
R. E. Roberson *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 209-220 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The salient aspects are given for a dynamic simulation of multibody systems which provide for nonlinear relative motion, relative translation as well as rotation between bodies, arbitrary interconnection topology and stable control of numerical errors in constraint equations. It is based on the Roberson/Wittenburg Eulerian dynamical formalism, the major features of which are also summarized. Author (ESA)

N78-20218# Genoa Univ. (Italy). Inst. of Applied Mechanics.
IMPROVING SPACECRAFT ATTITUDE CONTROL ACCURACY WITH ONLINE STATISTICAL OBSERVERS
R. C. Michelini, R. Molfino, R. Santoro, and C. Casarosa (Pisa Univ., Italy) *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 221-229 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The problem of improving the attitude control accuracy for high performance operational satellites is considered. The attitude corrections are performed by forcing strategies computed through a state dynamics reconstructor, incorporated in the controlling loop, having the function to reduce the sensors data uncertainty. An example application is described which refers to the attitude normal mode control of a three axis satellite. A statistical type observer is implemented, constructed by polynomial simulation, and applying continuous corrections by means of redundant reaction-wheels inertial-actuation. Author (ESA)

N78-20219# Engins Matra, Velizy (France).
MULTIPLE-MICROPROCESSOR SYSTEMS IN ATTITUDE AND ORBIT CONTROL SUBSYSTEMS
J. Soubirou *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 233-239 (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

Multiple-microprocessor systems designed to mechanize the signal and data processing functions of the Attitude and Orbit Control Subsystems (AOCS) are discussed. As a result of a survey of AOCS processing and data handling tasks, multiprocessor architectures of multiple instruction multiple data type (centralized and distributed) are reviewed and classified depending upon the redundancy concept and efficiency. The very large spectrum of mission requirements calls for a modular programmable control electronics capable of evolving from minimum to complex systems. Author (ESA)

N78-20220# Societe Crouzet, Valence (France).
MICROPROCESSORS AND LSI-ELECTRONICS IN ATTITUDE CONTROL SYSTEMS
J. C. Arnaud, J. P. Aulagnon, and C. J. Reimers (ESTEC) *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 241-247 ref (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

With the recent advent of LSI microprocessors and more powerful semiconductor memories, it appears now feasible to use adaptive digital processing techniques for dedicated signal conditioning tasks. Some apparent advantages of the Adaptive Control Electronics (ACE) in comparison with conventional special purpose electronics are its programmability avoiding cumbersome hardware modification of the ACE for particular problem adaptation and low cost, mass and power consumption. The main trade off studies for ACE definition (July to November 1975) are described and a short presentation of the prototype model is made. Author (ESA)

N78-20221# Ferranti Ltd., Edinburgh (Scotland).
HARDWARE ASPECTS OF INERTIAL ATTITUDE CONTROL SYSTEMS
A. D. King *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 249-258 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

A general review of hardware tradeoffs is presented. The preferential arrangement is an inertial unit, with a separate electronics unit containing redundant data processors, instrument interface, and interface for optical sensors. Gyro axes configurations are reviewed. Characteristics of floated rate integrating gyros are outlined, taking the Ferranti type 125 as an example. The electrical interface is considered, and the tradeoffs between analog and pulse rebalance. Concluding the former to be superior in this context, a precision encoding scheme is presented. Data processor requirements are reviewed, the Ferranti parallel DISC computer serving as an example. Reliability, mechanical and thermal aspects are considered. Author (ESA)

N78-20222# Engins Matra, Velizy (France).
ATTITUDE CONTROL LAWS IMPLEMENTATION USING PROGRAMMABLE DIGITAL CONTROLLERS. STUDY AND DEVELOPMENT ASPECTS
R. Havas *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 259-272 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

Some aspects of the implementation of attitude control laws algorithms on PDC (Programmable Digital Controllers) are presented. A review of the synthesis techniques for digital filters is the point of major interest. Four digitalization techniques - the standard Z-transform, the bilinear transform, and 2 space state representations - are reviewed. The main filter structures - direct, parallel, cascade, multirhythm, and non recursive - are presented. The effect of finite length words filter coefficients is studied and methods for ensuring the stability are proposed. Overflow problems for the fixed point arithmetics are mentioned. The last part is an intent to define the physiognomy of the development of an AOCS flying PDC's. Author (ESA)

N78-20223# Engins Matra, Velizy (France).
CLOSED LOOP TEST PHILOSOPHY IN AOCS DEVELOPMENT AND INTEGRATION
R. Cau *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 273-278 (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The on going and future spacecrafts of ESA are often based on sophisticated three axis attitude and orbit control subsystems using different technologies. A major problem occurring during the system development is to ensure that the whole subsystem shall have the expected dynamic behavior, once integrated in the spacecraft. The aim of a test policy is to give an answer to this problem. An efficient test method shall ensure that the attitude and orbit control subsystem operates in a realistic dynamic and kinematic way. A good choice is a compromise between a purely static test using all equipment assembled, the satellite motion being simulated on an external computer, and a complete three axis simulation table, which is a sophisticated solution. The configuration using a one axis air bearing table combined with an I. R. stimuli controlled in a transverse direction was selected for OTS and MAROTS development, together with a test sequence in two steps. Author (ESA)

N78-20224# British Aircraft Corp. (Operating) Ltd., Bristol (England).
ASPECTS OF THE DESIGN AND FUNCTIONAL TESTING OF A DOUBLE GIMBALLED WHEEL CONTROL SYSTEM
M. J. Hammond *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 279-290 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

An attitude control system based on Double Gimballed Momentum Wheel (DGMW) was tested on the BAC Three Axis Test Facility (TATF). Aspects of the control system design and functional testing are described. These tests were supported by both digital and analog simulations in order to achieve a high degree of confidence in system performance and operation. Correct system operation is demonstrated by the tests and in particular the indirect method of yaw control associated with this type of system. Author (ESA)

N78-20225# Officine Galileo S.p.A., Florence (Italy).
ELECTRO OPTICAL EARTH AND SUN SENSORS FOR SPINNING SATELLITES: THE STATE OF THE ART IN OFFICINE GALILEO
R. Bencivenni and I. Varano *In* ESA Attitude and Orbit Control

Systems Nov. 1977 p 293-301 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The elevation sensors flying on board the European GEOS and OTS satellites to determine their attitude during the spinning phase, are described. Two fan beam earth and sun sensors, developed by Officine Galileo for future application, are reviewed. The performance test philosophy for sensors of the type 'horizon crossover indicator' is shortly explained. Author (ESA)

N78-20226# Technische Physische Dienst TNO-TH, Delft (Netherlands).
STAR MAPPER: A SENSOR FOR ATTITUDE DETERMINATION OF SPINNING SPACECRAFT
C. W. deBoom *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 303-308 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The principles of operation of the star mapper, a sensor for determination of the attitude of arbitrarily oriented axes of spinning spacecraft are given. After a listing of design requirements for a sensor delivering one arc min accuracy a description of the system built around a silicon p-n junction light sensitive detector is presented. The optimization of the signal-to-noise ratio for the detection of pico-Ampere signal currents in a background of noise resulting in requirements on optical design and signal conditioning electronics is described. The actual performance measured on a prototype sensormodel is reported. The accuracy in determination of star positions can be better than 20 arcsec, considerably below specification. An extrapolation of performance to conditions other than for a model mission with a spin rate of 10 rpm is given. Some aspects of a study on the necessary groundprocessing of star mapper data is mentioned. Author (ESA)

N78-20227# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).
HIGH ACCURACY STATIC EARTH SENSORS
F. Desvignes, F.-X. Doittau, J. Jamet, and J.-P. Krebs *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 309-320 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

After recalling the interest of three-axis attitude controlled spacecraft with respect to the earth, and the related constraints for earth sensors, the interest of static devices, and the main problems in their design and manufacture are pointed out. The three types of earth static sensors developed by SODERN for the Symphonie, Aerosat, and OTS projects are described, showing the progress in the concepts, accuracy, and versatility; the main characteristics of the various types are summarized in figures and in a table. A brief description of functional tests method and equipment is given. Author (ESA)

N78-20228# Officine Galileo S.p.A., Florence (Italy).
TWO AXIS INFRARED EARTH SENSOR IRES FOR THREE AXIS STABILIZED SATELLITES
G. deVidi and G. Simoncini *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 321-330 (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The principle of operation and the configuration of the two-axis Infrared Earth Sensor (IRES) developed by Officine Galileo for OTS and Marots programs are described. The IRES sensor, designed to operate on three-axis stabilized satellites at geosynchronous altitude, as an accurate instrument for the measurement of the pitch and roll attitude angles with respect to the center of the earth disk. The IRES sensor, based on the electromechanical modulation of the incident energy from the earth horizon in the 14 + 16.25 micro wavelength band, can operate either at null and in offset pointing conditions. Author (ESA)

N78-20229# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).
STAR TRACKER FOR IPS
F.-X. Doittau and A. Juvigny *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 331-335 Sponsored by ESA (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

An image dissector tube high accuracy star/sun tracker was designed for the Spacelab instrument pointing system recalibration. Stars with up to +8M sub v can be acquired and tracked in a 2 deg x 2 deg field. Accuracy, noise excluded, is 0.75 arc sec. RSS and noise is less than 0.65 arc sec. (1 sigma) for an 8M sub v star. Two-star operation is possible without modification and the sun can be tracked too using a special attachment.
Author (ESA)

N78-20230# Consiglio Nazionale delle Ricerche, Frascati (Italy).
A HIGH PRECISION ON BOARD COMPUTING STAR SENSOR
C. D. LaPadula, V. F. Polcaro, and P. Ubertini *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 337-340 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

A non expensive, microcomputerized high precision star sensor is described. The general guidelines of the mechanical structure, electronic chain, and mathematical support for data handling are presented. The device was developed as an autonomous subsystem to drive a stabilized platform in a hard X-rays astrophysical experiment on-board of a transatlantic balloon. Author (ESA)

N78-20231# Royal Aircraft Establishment, Farnborough (England).
A SOLID STATE STAR SENSOR FOR UPDATING A SATELLITE INERTIAL ATTITUDE CONTROL SYSTEM
C. T. Farr *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 341-348 (For availability see N78-20198 11-18)
Copyright. Avail: NTIS HC A24/MF A01

A new star sensor which is at present being developed at the Royal Aircraft Establishment to remove both bias and drift from a satellite inertial attitude control system by periodically referring the attitude of the spacecraft to reference stars is detailed. The sensor which is based on the latest CCD technology is designed to detect stars down to m sub v less or equal to +4 with a measuring accuracy of a few arc seconds. Author (ESA)

N78-20232# Sira Inst. Ltd., Chislehurst (England).
EVALUATION OF IMAGE DISSECTOR TUBES AND CCD IMAGE SENSORS FOR HIGH ACCURACY STAR SENSOR APPLICATIONS
D. J. Purll, A. J. Allnutt, and J. A. Smith *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 349-358 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

Future strapdown star sensors will require tracking accuracies of one arc sec or better in a 2 deg x 2 deg field of view. This is beyond the basic pixel resolution of available imaging devices. A fine interpolation technique is required in which the star image is balanced over adjacent pixel positions. Of the two contending detectors, the main disadvantage of the image dissector tube is that the positioning of the pixels is subject to scanning distortions and influence by factors such as external magnetic fields and magnetic hysteresis. The elements in a charge coupled device form a stable coarse reference grid, but the fine interpolation between elements is degraded by nonsmooth optical structure on the surface of the device. Both suffer from non-uniformity of sensitivity, of different nature. Results from tests on both types of device are reported and some calibration requirements estimated. Author (ESA)

N78-20233# Hollandse Signaalapparaten N. V., Hengelo (Netherlands).
TEST EXPERIENCE, GREASE INVESTIGATION, EVALUATION AND POSSIBLE FUTURE DEVELOPMENTS OF FIXED MOMENTUM WHEELS WITH HYDRODYNAMIC GREASE LUBRICATED SPIRAL GROOVE BEARINGS
U. vanderWal *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 361-367 refs (For availability see N78-20198 11-18)
Avail: NTIS HC A24/MF A01

The present status of a fixed momentum wheel with hydrodynamic bearing which has passed the qualification phase is briefly described. Delivery and the application in communication satellites were due in 1977. The present status is based on

data measured during acceptance tests and permits a preliminary evaluation. Author (ESA)

N78-20234# Hawker Siddeley Dynamics Ltd., Stevenage (England).

DESIGN, DEVELOPMENT AND QUALIFICATION OF A 2 Nms REACTION WHEEL

J. M. Standing and J. M. Sheppard *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 369-374 ref (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The design development and qualification of a low mass 2 Nms reaction wheel is presented. The mechanical design is described in some detail, with particular attention being paid to the bearing system design and its impact upon momentum storage growth of up to 20 Nms. The principal results of development and qualification testing have also been included. Author (ESA)

N78-20235# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).

SATELLITE MOMENTUM AND REACTION WHEELS WITH MAGNETIC BEARINGS

P. Poubeau, J.-P. Baudry, and A. Robinson (ESTEC) *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 375-388 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The constructional features and performance parameters of a family of magnetically suspended momentum and reaction flywheels developed by Aerospatiale under ESA contracts for satellite stabilization purposes are described. The various functional elements contained in these wheels are discussed in detail, together with the rationale behind their design and selection. Overall comparisons are drawn between magnetic bearing and conventional bearing wheels and it is shown that magnetic bearings are superior not only from the reliability point of view, but also with respect to mass and power considerations. Author (ESA)

N78-20236# Hawker Siddeley Dynamics Ltd., Stevenage (England).

AN OPTIMISED 50 Nms MOMENTUM WHEEL UTILISING MAGNETIC REPULSION BEARINGS

A. J. Harrison *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 389-393 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The development and optimization of a 50 Nms Magnetically Suspended Momentum Wheel (MSMW) is presented. Following a brief outline of the design and performance of a prototype wheel, the mechanical design of the optimized model is described in some detail. Particular attention is paid to the magnetic repulsion bearing and structural damping, both of which are unique to this MSMW design. Main performance characteristics are presented. Author (ESA)

N78-20237# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).

MAGNETIC BEARING MOMENTUM WHEELS WITH MAGNETIC GIMBALLING CAPABILITY FOR 3-AXIS ACTIVE ATTITUDE CONTROL AND ENERGY STORAGE

R. S. Sindlinger *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 395-401 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

Momentum wheels with active magnetic bearings provide low friction torque and virtually unlimited life time. They have an inherent magnetic gimballing capability which allows to realize a 3-axis active attitude control system with only one rotation mass. Very high reliability excluding any single-point failure mode can be assured with proper redundancy. Two different approaches to a momentum wheel with magnetic suspension and gimballing are described: a disk-shaped one with electromagnetic bearings, and a ring-shaped one with electrodynamic bearings. The performance characteristics obtained from theoretical considerations are compared with the results of tests performed with advanced engineering models. Finally, an outlook is given to the application for integrated energy storage/attitude control systems. Author (ESA)

N78-20238# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

BI-PROPELLANT PROPULSION SYSTEMS FOR SPACECRAFT INJECTION AND CONTROL

M. A. Schwende and H. Strobl *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 405-412 (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The low thrust bi-propellant propulsion systems, developed by MBB, demonstrated their operational space qualification during launch, injection, and orbit operation of two Symphonie missions. This presentation shows the flight results of both engine types and summarizes their main characteristics. In addition to these data results on performance increase studies are presented. This performance increase is possible by modifying the engines themselves and/or by modifying the engine feed systems. A further aspect of this paper is concentrated on the use of both engine types in a common propulsion system (injection and orbit control) using one single storage and feed system as planned for JOP and proposed for the ESA out of ecliptic mission. Author (ESA)

N78-20239# Technologieforschung G.m.b.H., Stuttgart (West Germany).

OPTIMISED ORBIT INJECTION AND ATTITUDE CONTROL WITH THE TIROC BIPROPELLANT AOCS

E. E. Schaefer and H. P. Mok *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 413-423 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The TIROC 3-N-bipropellant rocket engine has successfully passed vacuum qualification tests. The ability of this engine to cover a range of burning time between 0.001 and 1 mill sec allows a new AOCS-conception: orbit transfer, station acquisition, station keeping, and attitude control can be carried out by one and the same propulsion system, leading to new aspects of reliability, development time, and cost by using standardized components. Since Hohman-transfer for orbit changes can only be carried out if either the thrusters are strong enough or the neighboring orbits are very close, new methods are necessary for vehicles with very low thrust, like the TIROC AOCS with e.g. 12 N, or for orbits with great distances in between. For attitude control, the high switching frequencies of the thrusters allow a modified bang-bang-process for long control durations and time variant end-conditions. Author (ESA)

N78-20240# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).

PERFORMANCE DEMONSTRATION OF 0.5 N AND 2.0 N MONOPROPELLANT HYDRAZINE THRUSTERS

H. D. Schmitz, P. Tiedtke, and M. Steenborg *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 425-434 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

A description of the OTS/MAROTS reaction control assembly, the first hydrazine monopropellant propulsion system of a European body stabilized spacecraft is made. The main part of the paper deals with the qualification of a high level thruster with 0.5 to 2.0 N vacuum thrust and a low level thruster with 0.2 to 0.75 N vacuum thrust. Both thrusters were developed by ERNO according to the OTS/MAROTS orbit and attitude control requirements. The general design of the thrusters and the results of the two qualification programs are presented. The performance of the thrusters are shown on charts and graphs containing the evaluation of the qualification firings. Author (ESA)

N78-20241# Societe Europeene de Propulsion, Moissy-Cramayel (France).

HYDRAZINE THRUSTERS FOR SPACE APPLICATIONS

R. Valentini *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 435-444 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The description, characteristics, development program, and test results of two hydrazine thrusters are presented. The first one is the 15 N catalytic thruster presently in orbit on European GEOS satellite; for this one CNESRO catalyst development and endurance tests results are also given. At the lower limit of

thrust range, electrothermal 0.3 N thruster for communication satellites is also presented. Author (ESA)

N78-20242# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Trauen (West Germany).

A NEW CATALYST FOR MONOPROPELLANT HYDRAZINE THRUSTERS

W. Hartung, G. Weidenbach (Kali-Chemie), and P. Tiedtke (ERNO Raumfahrt-tech.) *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 445-451 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

In 1969 a hydrazine catalyst development program was started by the German Ministry of Research and Technology to get a catalyst having the same performance as the Shell 405. The development and the test activities were conducted by the Kali-Chemie Joint-Stock Company, ERNO Raumfahrttechnik GmbH, and the Institute for Chemical Propulsion and Process Technology of DFVLR at Fassberg. When the catalyst development was successfully finished a qualification program for the new catalyst KC IR 12 GA was initiated consisting of mechanical improvement of catalyst substrate, verification of manufacturing reproducibility, and qualification firing with three thrusters of different thrust levels. The results of the tests with the KC IR 12 GA are presented in comparison to those of the Shell 405 ABSG. Author (ESA)

N78-20243# Royal Aircraft Establishment, Farnborough (England). Space Dept.

DEVELOPMENT OF A POWER AUGMENTED ELECTRO-THERMAL HYDRAZINE THRUSTER

G. E. Keyte *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 453-459 refs (For availability see N78-20198 11-28)

Copyright. Avail: NTIS HC A24/MF A01

The design of an augmented hydrazine thruster for station-keeping of future geosynchronous satellites is presented. The preliminary development of this design was focussed on three research topics; (1) decomposition chemistry, (2) gas dynamics of heater and nozzle, and (3) high temperature materials. The progress of work in these areas is described and their impact on thruster design is discussed. It is concluded that the design offers the promise of obtaining a substantial increase in performance without a significant risk of failure. Author (ESA)

N78-20244# Royal Aircraft Establishment, Farnborough (England). Space Dept.

FLOW-FIELD COMPUTATION IN THE HEATER AND NOZZLE OF A POWER AUGMENTED ELECTROTHERMAL HYDRAZINE THRUSTER

B. C. Barber *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 461-470 refs (For availability see N78-20198 11-18)

Copyright. Avail: NTIS HC A24/MF A01

A numerical technique for computing the flowfield in the gas heater and nozzle of a power augmented electrothermal hydrazine thruster is described. The flowfield is computed by solving a parabolic form of the Navier-Stokes equations. The three boundary layer equations (conservation of momentum, energy balance, and continuity) are transformed by Von Mises transformation, to give two equations, the cross stream variable being the compressible stream function. These equations are solved numerically by a fully implicit central difference method (a marching integration procedure). The entire flowfield on the tube and nozzle, including the supersonic flow is thus computed. A flowflied computation is presented showing the variation of temperature and pressure in the heater and nozzle, and the variation of the displacement thickness in the nozzle and its effect on specific impulse. Author (ESA)

N78-20245# Royal Aircraft Establishment, Farnborough (England). Space Dept.

ELECTRO-THERMAL HYDRAZINE THRUSTER VISUALISATION STUDY

A. J. Barter *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 471-477 refs (For availability see N78-20198 11-18)

Copyright. Avail: NTIS HC A24/MF A01

Preliminary performance tests of a prototype 0.5N electro-thermal Hydrazine Thruster (EHT), designed for spacecraft attitude control, highlighted a number of unexplained characteristics in the decomposition chamber pressure. In order to gain a fundamental understanding of the processes occurring within the chamber, a high speed cinematic study was undertaken involving simultaneously recording a number of chamber parameters. This enabled a direct correlation to be made of the visible phenomena and the measured data. A description of the transparent electro-thermal thrusters and techniques used is presented together with examples of the results. The knowledge gained from this research has led to the development of an improved EHT design and design philosophy of this modification is indicated. Author (ESA)

N78-20246# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Trauen (West Germany).

THERMAL HYDRAZINE DECOMPOSITION: INVESTIGATION ON A PROMISING TECHNIQUE FOR FUTURE SATELLITE PROPULSION

H. Twardy *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 479-487 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

Thermal hydrazine decomposition represents a necessary alternative to the catalytic decomposition process, with a view to long-life applications and minimum thrust propulsion for satellites. The temperature increase of the hydrazine required to trigger the thermal decomposition is effected through heat exchange on (electrically) heated areas in the thruster. The use of metal foam proved to be a very promising solution, since it is then possible to distribute even very small propellant mass flows, as was shown by the tests down to a thrust level of 30 mN. The effects of different temperatures and different modifications of the propellant injection into the metal foam on the operation and the thermal loading were investigated at propellant mass flow variations in the ratio 10:1 and above. The results obtained could be used to establish a favorable basis for the further application of the metal foam technique in gas generators or in hydrazine thrusters with augmented electrical heating. Author (ESA)

N78-20247# Royal Aircraft Establishment, Farnborough (England). Space Dept.

A REVIEW OF THE UK T5 ELECTRON-BOMBARDMENT MERCURY ION THRUSTER

D. G. Fearn *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 491-510 refs (For availability see N78-20198 11-18)

Copyright. Avail: NTIS HC A24/MF A01

The technical status of the T5 10 cm diameter ion thruster, with particular reference to those performance characteristics of interest to the north-south station-keeping of longlife communications spacecraft is reviewed. The derivation of this thruster from the T4A device is described and details of relevant test programs are given. It is shown that its correlated mass utilization efficiency of almost 90%, its modest energy consumption of under 230 W at 10 mN thrust, and the proven lifetime of over 5000 hours of its components makes it an ideal choice for many missions. It is also demonstrated that the deposition of contaminants derived from the thruster onto the solar arrays of a communications spacecraft should remain within acceptable limits for more than 5000 hours of thruster operation. In addition, the wide throttling range available provides a further attractive feature. Finally, brief details are given of the propellant tank, valve and flowmeter being developed in parallel with the thruster. Author (ESA)

N78-20248# Engins Matra, Velizy (France).

SATELLITE DESIGN ASPECTS OF APPLYING ELECTRIC PROPULSION FOR GEOSTATIONARY SATELLITES

J. Broquet and P. Luquet *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 511-520 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

For a long time, electrical propulsion has appeared an attractive technology for reducing the propellant mass required for the NS orbital control of geostationary satellites. The high complexity of electrical propulsion components leads to the concept of integrated Electric Propulsion Packages (EPP's). The satellite geometrical limitations constrain these packages to be implemented on both east and west sides of the satellite in such a way that they must be operated simultaneously to perform

north-south station keeping. The high peak power requirement during thrusting theoretically imposes a very significant penalty on the solar array sizing. Fortunately, optimized orbital control strategy based on EPP flexibility and on the variation of the solar generator power delivery during the satellite lifetime, allows this penalty to be minimized. The very long duration of station keeping maneuvers and low disturbance renders especially attractive the use of a one or two degrees of transverse freedom attitude control system and imposes a new optimization of the yaw sensing. Author (ESA)

N78-20249# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.

AN OVERVIEW OF THE RIT-10 RADIO-FREQUENCY THRUSTER SYSTEM

H. Bassner (MBB), K. H. Groh (Giessen Univ., West Ger.), G. Kruelle, and E. Zeyfang *In* ESA Attitude and Orbit Control Systems Nov. 1977 p 521-548 refs (For availability see N78-20198 11-18)

Avail: NTIS HC A24/MF A01

The electric propulsion system RIT-10 operated on mercury propellant providing a thrust of 10 mN at a specific impulse of 3000 s and a total input power of 360 W, is in a development status that guarantees space qualification within a time schedule to fit Ariane H-Sat flight where RIT-10 is proposed as a N-S station keeping experiment. Advantages of applying electric propulsion for space missions, in particular, N-S station keeping, are pointed out, and RIT-10 development history and program organization are described. Subsequently, in main parts A, B, C the state of development, testing procedures to evaluate function, life, and compatibility, and applications envisaged now and in future of the very flexible RIT spectrum (3 to 160 nM), are discussed. Thus, a system is introduced that may serve to break the confidence barrier still opposed to EP. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N78-20250*# TRW Defense and Space Systems Group, Redondo Beach, Calif. Power Conversion Electronics Dept.

EXTENDED PERFORMANCE ELECTRIC PROPULSION POWER PROCESSOR DESIGN STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report, 1 May - 25 Oct. 1977

J. J. Biess, L. Y. Inouye, and A. D. Schoenfeld Nov. 1977 83 p

(Contract NAS3-20403)

(NASA-CR-135357; TRW-31526.000-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 21C

Several power processor design concepts were evaluated and compared. Emphasis was placed on a 30cm ion thruster power processor with a beam supply rating of 2.2kW to 10kW. Extensions in power processor performance were defined and were designed in sufficient detail to determine efficiency, component weight, part count, reliability and thermal control. Preliminary electrical design, mechanical design, and thermal analysis were performed on a 6kW power transformer for the beam supply. Bi-Mod mechanical, structural, and thermal control configurations were evaluated for the power processor, and preliminary estimates of mechanical weight were determined. A program development plan was formulated that outlines the work breakdown structure for the development, qualification and fabrication of the power processor flight hardware. Author

N78-20251*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STATUS OF SERT II SPACECRAFT AND ION THRUSTERS, 1978

W. R. Kerslake and L. R. Ignaczak 1978 10 p refs Presented at the 13th Intern. Elec. Propulsion Conf., San Diego, Calif., 25-27 Apr. 1978; sponsored in part by AIAA and DGLR

(NASA-TM-78827; E-9531) Avail: NTIS HC A02/MF A01 CSCL 21C

The historical record of the SERT 2 spacecraft and ion thruster systems for 8 years since the February 1970 launch is reviewed. The original SERT 2 mission, one year duration, was planned with the spacecraft in a continuous sunlight orbit to provide continuous solar power. An extended mission, using intermittent power available from an earth shadowed orbit was performed during the past 5 years while waiting for the orbit to change again to continuous sunlight in early 1979. Continuous thruster testing is planned in 1979. Both spacecraft and ion thruster systems are near-fully functional when the solar array is illuminated. Thruster system 2 is fully operational. Thruster system 1 continues to demonstrate relight capability, but the high-voltage-grid short remains. Author

N78-20252 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.

COMBUSTION INSTABILITY IN SOLID ROCKET MOTORS. VOLUME 1: EXECUTIVE SUMMARY

E. W. Price (Ga. Inst. of Technol.) Nov. 1977 16 p refs Prepared by JANNAF Combust. Working Group

(Contract N00017-72-C-4401)

(AD-A050420; CPIA-Publ-290-Vol-1) Avail: Issuing Activity CSCL 21/7

The nature of combustion instability is discussed as well as its impact on the rocket vehicle, the propulsion system, the exhaust, and the environment. Ways are suggested for minimizing the risk through the selection of propellant, and propellant grain design measurements during motor firings, and monitoring during production and service. Author

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N78-20253# Sandia Labs., Albuquerque, N. Mex.

MATERIALS COMPATIBILITY INFORMATION DATA BANK

K. E. Mead 1977 10 p Presented at the 5th ERDA Compatibility Meeting, Miamisburg, Ohio, 4 Oct. 1977

(Contract EY-76-C-04-0789)

(SAND-77-1237C; Conf-771012-1) Avail: NTIS HC A02/MF A01

A major concern in the design of weapons systems is the compatibility of the materials used with each other and with the enclosed environment. Usually these systems require long term storage with a high reliability for proper function at the end of this storage period. Materials selection is then based on both past experience and laboratory accelerated aging experiments to assure this long term reliability. To assist in the task of materials selection a computerized materials compatibility data bank is being established. This data bank will provide a source of annotated information and references to personnel and documents for both the designer and materials engineer to draw on for guidance in materials selection. The data bank storage and information retrieval philosophy are discussed and procedures for information gathering outlined. Examples of data entries and

search routines are presented to demonstrate the usefulness and versatility of the proposed system. ERA

24 COMPOSITE MATERIALS

Includes laminates.

N78-20254*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASUREMENT OF THE TIME-TEMPERATURE DEPENDENT DYNAMIC MECHANICAL PROPERTIES OF BORON/ALUMINUM COMPOSITES
J. A. DiCarlo and J. E. Maisel (Cleveland State Univ.) 1978 43 p refs Presented at the 5th Conf. on Composite Mater.: Testing and Design, New Orleans, 20-23 Mar. 1978; sponsored by Am. Soc. for Testing and Mater.
(NASA-TM-78837; E-9548) Avail: NTIS HC A03/MF A01 CSCL 11D

A flexural vibration test and associated equipment were developed to accurately measure the low strain dynamic modulus and damping of composite materials from -200 C to over 500 C. The basic test method involves the forced vibration of composite bars at their resonant free-free flexural modes in a high vacuum cryostat furnace. The accuracy of these expressions and the flexural test was verified by dynamic moduli and damping capacity measurements on 50 fiber volume percent boron/aluminum (B/Al) composites vibrating near 2000 Hz. The phase results were summarized to permit predictions of the B/Al dynamic behavior as a function of frequency, temperature, and fiber volume fraction. Author

N78-20255*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORRELATION OF FIBER COMPOSITE TENSILE STRENGTH WITH THE ULTRASONIC STRESS WAVE FACTOR
Alex Vary and Raymond F. Lark 1978 23 p refs Presented at the 1978 Spring Conf., New Orleans, 3-7 Apr. 1978; sponsored by Am. Soc. for Nondestructive Testing
(NASA-TM-78846; E-9564) Avail: NTIS HC A03/MF A01 CSCL 11D

An ultrasonic-acoustic technique was used to indicate the strength variations of tensile specimens of a graphite-epoxy composite. A stress wave factor was determined and its value was found to depend on variations of the fiber-resin bonding as well as fiber orientation. The fiber orientations studied were 0 deg (longitudinal), 10 deg (off-axis), 90 deg (transverse), [0 deg + or - 45 deg/0 deg] symmetrical, and [+ or - 45 deg] symmetrical. The stress wave factor can indicate variations of the tensile and shear strengths of composite materials. The stress wave factor was also found to be sensitive to strength variations associated with microporosity and differences in fiber-resin ratio. Author

N78-20256*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF FABRICATION AND JOINING PROCESSES ON COMPRESSIVE STRENGTH OF BORON/ALUMINUM AND BORSIC/ALUMINUM STRUCTURAL PANELS
Dick M. Royster, H. Ross Wiant (Vought Corp., Hampton, Virginia), and Robert R. McWithey Apr. 1978 55 p refs
(NASA-TP-1121; L-11728) Avail: NTIS HC A04/MF A01 CSCL 11D

Processes for forming and joining boron/aluminum and borsic/aluminum to themselves and to titanium alloys were studied. Composite skin and titanium skin panels were joined to composite stringers by high strength bolts, by spotwelding, by diffusion bonding, by adhesive bonding, or by brazing. The effects of the fabrication and joining processes on panel compressive strengths were discussed. Predicted buckling loads were compared with experimental data. Author

N78-20257*# General Dynamics/Convair, San Diego, Calif.
THERMAL PERFORMANCE OF A CUSTOMIZED MULTILAYER INSULATION (MLI). DESIGN AND FABRICATION OF TEST FACILITY HARDWARE Final Report
K. E. Leonhard 15 Aug. 1975 67 p refs
(Contract NAS3-17756)
(NASA-CR-135051; CASD-NAS-75-006) Avail: NTIS HC A04/MF A01 CSCL 11D

The design, fabrication, and assembly of hardware for testing the performance of a customized multilayer insulation are discussed. System components described include the thermal payload simulator, the modified cryoshroud, and a tank back pressure control device designed to maintain a constant liquid boiling point during the thermal evaluation of the multilayer insulation. The thermal payload simulator will provide a constant temperature surface in the range of 20.5 to 417K (37 to 750R) for the insulated tank to view. The cryoshroud was modified to establish a low temperature black body cavity while limiting liquid hydrogen usage to a minimum feasible rate. Author

N78-20258# California Univ., Los Angeles. Dept. of Materials.
STRESS CONCENTRATION DUE TO A PROLATE SPHEROIDAL INCLUSION
M. Shibata and Kanji Ono Jan. 1978 14 p refs
(Contract N00014-75-C-0889)
(AD-A050167; ONR-TR-6) Avail: NTIS HC A02/MF A01 CSCL 20/11

Internal stresses inside a prolate spheroidal inclusion parallel to a uniaxial applied stress are obtained by using Eshelby theory. Effects of the elastic modulus and the aspect ratio of the inclusion are evaluated. The present results are compared with others, in particular, with Argon's solution for a slender rod. Author (GRA)

N78-20259# Air Force Systems Command, Wright-Patterson AFB, Ohio.
METAL-CERAMIC ALLOY FOR PACKING GAS TURBINES
Yu. N. Semenov, G. L. Dubrov, and N. A. Kazantseva 28 Jul. 1977 8 p Transl. into ENGLISH from Patent (USSR), no. 195635, 4 May 1967 p 1
(AD-A049387; FTD-ID(RS)T-1206-77) Avail: NTIS HC A02/MF A01 CSCL 13/8

Nickel and boronitride metallic-ceramic at high temperatures adversely affect the properties of adaptability of the packing materials to fitting. A brief discussion is presented dealing with the composition of these alloys for increasing heat resistance. G.Y.

N78-20260# Brookhaven National Lab., Upton, N. Y.
EFFECT OF STEAM OXIDATION ON THE TENSILE STRENGTH OF HTGR STRUCTURAL GRAPHITES
A. J. Romano and J. G. Y. Chow 1977 16 p refs Presented at the Thermal Reactor Safety Meeting, Sun Valley, Idaho, 31 Jul. 1977
(Contract EY-76-C-02-0016)
(BNL-NUREG-23000; Conf-770708-3) Avail: NTIS HC A02/MF A01

The core support system of the High Temperature Gas Cooled Reactor (HTGR) contains type PGX graphite as core support blocks. The change in ultimate tensile strength of PGX graphite specimens with oxidation (burnoff) was determined in a safety related experimental program. It was shown that Fe, an impurity in PGX graphite, plays a key role in the rate of oxidation. The subsequent failure of the graphite specimens is dependent upon the total weight loss due to oxidation. The results indicate that the loss in tensile strength is exponentially related to the percent burnoff (weight loss), and that grain orientation of the specimen has a significant effect. ERA

N78-20261# National Physical Lab., Teddington (England). Div. of Materials Applications.
CREEP BEHAVIOR OF DIRECTIONALLY SOLIDIFIED EUTECTIC COMPOSITES European Concerted Action. Cost 50 - Materials for Gas Turbines. Final Report
M. McLean, D. E. Miles, and P. N. Quested Oct. 1976 149 p refs
(NPL-DMA-248) Avail: NTIS HC A07/MF A01

The high temperature mechanical properties of directionally solidified eutectic composites, which offer considerable advantages in uniaxial creep over current superalloys, were critically examined under conditions relevant to the operation of land-base gas turbines. Substantial improvements in uniaxial creep can be

obtained by control of the processing conditions and a basis for material optimization is implicit in the results and in the modeling described. The improved creep properties are retained in the triaxial stresses caused by a sharp notch, and the steady-state creep behavior of non-axially stressed composites is well described by a simple model. Moreover, the anisotropic microstructures are stable in both isothermal and temperature gradient conditions likely to be encountered in service. These results indicate that eutectic composites are likely to satisfy the engineering design requirements for cooled turbine blades. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N78-20262 California Univ., Berkeley.
RESONANCE RAMAN SPECTROSCOPY OF MANGANESE (III) ETIOPORPHYRIN 1, CHROMIUM (III) TETRAPHENYLPORPHIN AND HEMOGLOBIN: THE DEPENDENCE OF RESONANCE ENHANCEMENT ON THE RESONANT ELECTRONIC TRANSITION Ph.D. Thesis
Sanford Abraham Asher 1977 205 p
Avail: Univ. Microfilms Order No. 77-31273

Magnetic circular dichroism and resonance Raman spectroscopy were used to study the electronic transitions of manganese (III) etioporphyrin 1 (MnETP). The data supported the assignment of the strong band of Mn (III) porphyrins between 460 to 490 nm to a charge transfer transition. The two bands occurring between 540 and 600 nm were assigned to vibronic components of a pi yield pi (*) transition. The band in the near UV appears to contain a number of components. Dramatic differences were found in the resonance Raman spectra of MnETP upon excitation within different absorption bands. Dissert. Abstr.

N78-20263 Utah State Univ., Logan.
AN INVESTIGATION OF THE COORDINATING PROPERTIES OF THE BORANOCARBONATES AND TETRAHYDROBORATE Ph.D. Thesis
Jerry Charles Bommer 1977 250 p
Avail: Univ. Microfilms Order No. 77-30634

The principle anions used in this investigation were H3BCO22-, H3BCO2C2H5-, H3BCO2H- and BH-. Their interactions with phosphine and phosphite stabilized copper(I) and silver(I), bis(cyclopentadienyl)-titanium(III) cation, as well as cobalt(II) and Cr(O), were investigated. The complexes prepared were characterized by elemental analysis, infrared spectroscopy, proton and boron nuclear magnetic resonance, and electron spin resonance. Molecular weights and neutral ligand dissociation constants for the copper and silver complexes in chloroform were determined by vapor pressure osmometry; conductivity studies were also carried out in acetonitrile for a number of these complexes. Dissert. Abstr.

N78-20264 Northwestern Univ., Evanston, Ill.
RAMAN SCATTERING FROM THE SUPERIONIC CONDUCTOR SILVER TETRAIODOMERCURATE (II) AND OTHER RELATED COMPOUNDS Ph.D. Thesis
Douglas Richard Greig 1977 148 p
Avail: Univ. Microfilms Order No. 77-32309

The effect of temperature on the Raman spectrum of Ag2-HgI4 was studied between 8 and 470 K. The silver-iodide modes between 80 and 106/cm broaden considerably at very low temperatures (below 100 K), and this is believed to be due to high anharmonicity of the silver ion potential well. The order-disorder phase transition at 323 K shows a dramatic change in the Raman spectrum; all of the bands broaden considerably, and the low frequency region simplifies to one peak at ca. 17/cm with a shoulder at ca. 30/cm. Disorder induced broadening is observed in amorphous solids, where it is shown that the Raman spectrum is reduced by Bose-Einstein and harmonic oscillator factors to arrive at an approximate density of states spectrum. High pressure spectra for M2HgI4(M = Ag, Cu, T1) were collected in a diamond anvil cell. The silver salt appears to have at least five distinct structural phases in the 0 to 10 kbar and 25 to 100 C region. The possibility of using Raman line broadening and Rayleigh line enhancement as a screening technique for superionic conductors is discussed. Dissert. Abstr.

N78-20265 California Univ., Berkeley.
FAST REACTIONS, FREE RADICALS, AND MOLECULAR COMPLEXES STUDIED BY THE MATRIX ISOLATION TECHNIQUE Ph.D. Thesis
Donald Lucas 1977 182 p
Avail: Univ. Microfilms Order No. 77-31448

After a mixture of NO:O3:N2 was deposited onto a CsI window and held at cryogenic temperatures, growth of a band at 1617 cm to the -1 power over a period of many hours was observed by infrared spectroscopy. Through the use of nitrogen and oxygen isotopes, ultraviolet photolysis, and comparison with known spectra, the band was identified as NO2. No change in the rate of growth of NO2 was observed when the incident infrared radiation intensity was varied by over an order of magnitude through the use of different infrared light sources with various filters. Experiments employing a rotatable 50K cold shield to completely cover the matrix showed that the reaction is not induced by photons in the infrared region. Dissert. Abstr.

N78-20266 Vanderbilt Univ., Nashville, Tenn.
THEORY OF ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY. 1: EFFECT OF AUTOMATIC FREQUENCY CONTROL SYSTEMS ON ELECTRON PARAMAGNETIC RESONANCE SPECTRA. 2: MOTIONAL EFFECTS IN ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY; DEVELOPMENT OF A GENERALIZED ROTATIONAL EVOLUTION OPERATOR Ph.D. Thesis
John Edward Stephens 1977 95 p
Avail: Univ. Microfilms Order No. 77-30376

A unified approach, which involves the application of electrodynamic and electronic principles, as well as spin density matrix techniques, was employed toward the resolution of the AFC problem. Within this framework, a modified density matrix equation of state was derived and the steady state solutions were carefully characterized. Relevant properties of the rotational group were exploited in order to derive a generalized rotational evolution operator in terms of Euler angles. The description of rotations, in terms of fixed magnitude and direction, was made more concrete through expressions of these constructs in terms of the well known Euler angles. The Euler angle description of orientational components was employed, in connection with the theory of rotational Brownian motion, to derive a density matrix/Liouville equation of state for application to the EPR of slowly tumbling radicals. Dissert. Abstr.

N78-20267 California Univ., Berkeley.
INDUCTION TIMES AND STRONG IGNITION LIMITS FOR MIXTURES OF METHANE WITH HYDROGEN Ph.D. Thesis
Robert Kai-Cheong Cheng 1977 172 p
Avail: Univ. Microfilms Order No. 77-31317

The study is a systematic experimental investigation of induction times and strong ignition limits of the methane-hydrogen-oxygen combustion system. Experiments were performed in a shock tube using the reflected shock technique. Ignition processes were observed by means of cinematographic laser schlieren and cinematographic laser-shear interferrometry. Induction times and strong ignition limits were determined on the basis of wave front trajectories in the time-space domain, deduced from pressure records. Test mixtures include two methane-oxygen mixtures, seven methane-hydrogen-oxygen mixtures, and two hydrogen-oxygen mixtures all diluted by 90% argon. Initial conditions of the experimental runs were in the range of 800 K - 2500 K in temperature and 1.4 atm - 3.0 atm in pressure. Dissert. Abstr.

N78-20268 Connecticut Univ., Storrs.
SHOCK TUBE MEASUREMENT OF NITRIC OXIDE AND ATOMIC OXYGEN BY MEANS OF CHEMILUMINESCENT RADIATION Ph.D. Thesis

Peter Phillip Ostrowski 1977 144 p
Avail: Univ. Microfilms Order No. 77-31209

A method was developed for the shock tube measurement of NO and O which is dependent on the assumptions that the NO formation process is governed by the Zeldovich mechanism and is not close to chemical equilibrium. Under these conditions both NO and O may be obtained from a single measurement of the NO-O chemiluminescent radiation. This technique has considerable advantages over other chemiluminescent methods, which require at least one additional measurement in order to separate NO and O from the measured product. Dissert. Abstr.

N78-20269 Texas Technological Univ., Lubbock.
A SOLAR ADSORPTION COOLING SYSTEM: AN ANALYTICAL AND EXPERIMENTAL STUDY Ph.D. Thesis
Manit Thongprasert 1977 277 p
Avail: Univ. Microfilms Order No. 77-31166

The solar adsorption cooling system is one which shows economic promise with regard to use with solar energy. In this system, air is used as the refrigerant in a process which entails drying of the air by moisture adsorption into silica gel, sensible heat rejection to the atmosphere, and subsequent rehumidification to produce a cooling effect. The adsorbent material is continuously regenerated by using hot air heated by a solar collector. The major system component which was studied in detail was the rotary adsorber. A mathematical model for a rotary bed was formulated and a numerical solution was obtained. To verify the model, an experimental system was designated and constructed. Using the model of a rotary bed along with the numerical model of other system components, a simulation was then formulated for predicting the thermal performance. Dissert. Abstr.

N78-20270 Pennsylvania Univ., Philadelphia.
CHRONOPOTENTIOMETRIC STUDIES IN MOLTEN SODIUM SILICATES Ph.D. Thesis
Lee Moyer Ruch 1977 216 p
Avail: Univ. Microfilms Order No. 77-30247

In melts of compositions Na2O-1.5SiO2, Na2O-2SiO2, and Na2O-3SiO2 the anodic discharge of oxide ions was found to be diffusion controlled and showed good agreement with the Sand equation at temperatures between 1000 and 1200 C and current densities between 0.05 and 0.6 amp per sq cm. The addition of 2.0 wt % NaF to a Na2O-2SiO2 melt resulted in a substantial increase in the oxide transition time and a second transition at a higher potential. Changing the gaseous atmosphere in equilibrium with the melt from oxidizing to reducing resulted in slight decreases in the oxide transition times and substantial increases in the quarter wave potential of the oxide transitions. The state of the oxidized varied with melt composition. Under strongly reducing conditions a further transition due to the oxidation of silicon was observed. Estimates of the concentration of S1(2+) in sodium trisilicate melts in equilibrium with CO and graphite are derived from these measurements.
Dissert. Abstr.

N78-20271 South Florida Univ., St. Petersburg.
KINETIC AND QUANTITATIVE APPLICATIONS OF AUGER ELECTRON SPECTROSCOPY Ph.D. Thesis
Dennis Michael Holloway 1977 91 p
Avail: Univ. Microfilms Order No. 77-29161

Auger electron spectroscopy was employed to study the diffusion of sulfur and carbon in alpha-iron. In the temperature range 298 K to 773 K carbon preferentially segregates to the surface. From 673 K to 973 K sulfur segregated to the surface while carbon was thermally desorbed. An Arrhenius analysis of the sulfur diffusion data yielded an activation energy of 14.5 kcal/mol, which was consistent with a grain boundary diffusion process. The kinetics of carbon migration were complicated by the thermal desorption which makes Arrhenius analysis impossible. The reactions of water vapor, carbon monoxide, and carbon dioxide with hydrides, as well as metal losses due to surface oxidation and interface interactions were important considerations with respect to projected uses in hydrogen storage and in neutron generator applications.
Dissert. Abstr.

N78-20272 Florida State Univ., Tallahassee.
AN EVALUATION OF A METAL FILAMENT VAPORIZER SAMPLE INTRODUCTION SYSTEM FOR A dc ARC PLASMA JET ATOMIC EMISSION SOURCE Ph.D. Thesis
Christopher Davey Keirs 1977 134 p
Avail: Univ. Microfilms Order No. 78-01487

An electro-thermally heated tantalum filament was characterized for use as a sample introduction device for a dc arc plasma jet atomic emission source. The dc arc, which employed arc column rotation as a stability enhancement technique, required a sample introduction system capable of supplying a dry aerosol while operating on a low flow rate of gas. The tantalum filament vaporizer was shown to meet these criteria while allowing microliter-sized samples to be analyzed. Dissert. Abstr.

N78-20273 Missouri Univ., Rolla.
THERMOCHEMICAL INVESTIGATIONS OF NEARLY IDEAL BINARY SOLVENTS Ph.D. Thesis
Thomas Elwood Burchfield 1977 194 p
Avail: Univ. Microfilms Order No. 7801707

The heats of solution of solutes at infinite dilution in binary solvent mixtures were determined as a function of the composition of the binary solvent mixtures for triethylamine, 3-ethylpentane, isopropyl ether, and 2,4-dimethylpentane in the cyclohexane + n-heptane solvent system; for n-propyl ether, triethylamine, n-heptane, 3-ethylpentane, squalane, and chloroform in the cyclohexane + carbon tetrachloride solvent system; for squalane, cyclohexane, benzene, and pyridine in the carbon tetrachloride + chloroform solvent system; for chloroform in the pyridine + carbon tetrachloride solvent system; and for squalane in the benzene + chloroform and triethylamine + chloroform solvent systems. The partial molar excess volumes of triethylamine, isopropyl ether, and 2,4-dimethylpentane as solutes at infinite dilution in binary mixtures of cyclohexane and n-heptane were also determined.
Dissert. Abstr.

N78-20274 Arizona Univ., Tucson.
COMPUTER METHODS IN THE STUDY OF CHROMATOGRAPHIC PROCESSES Ph.D. Thesis
John Bruce Phillips 1977 199 p
Avail: Univ. Microfilms Order No. 78-02090

The whole chromatographic system from sample input to computation of results was treated as a means of producing information from chemical processes. An analysis from the point of view of the production and flow of information makes it apparent that there are many untried ways of producing information from chromatographic systems. A cross correlation technique developed in this work is an example of a new chromatographic method resulting from this approach to chromatography. It is especially useful for gas-solid chromatography because it separates nonlinear effects from the linear chromatographic peak. Information about either linear or nonlinear behavior may be obtained without interferences from the other.
Dissert. Abstr.

N78-20275 California Univ., San Diego.
SOME SOLID STATE PROPERTIES OF HYDRIDES OF INTERMETALLIC COMPOUNDS Ph.D. Thesis
Harlan Fletcher Bittner 1977 205 p
Avail: Univ. Microfilms Order No. 7802102

Attempts were made to gain a fundamental understanding of criteria concerning synthesis, stability and bonding of the hydrides. In addition information was sought concerning the electronic state of hydrogen in metals. The effects of hydriding on magnetic properties were also explored. Intermetallic compounds were synthesized via induction techniques, and subsequently hydrided using pressures up to 100 atm and temperature to 600 C. Hydrides were also prepared via water vapor treatment of thin films and by a new technique, laser bombardment of bulk materials in a hydrogen atmosphere. Materials were analyzed by X-ray diffraction studies. Magnetic investigations involved measurements of magnetization versus temperature and field. Dissert. Abstr.

N78-20276 Delaware Univ., Newark.
THE GAS PHASE CHEMISTRY OF METAL AND METAL CONTAINING IONS WITH NEUTRAL ORGANIC SPECIES Ph.D. Thesis
John Allison 1978 376 p
Avail: Univ. Microfilms Order No. 7800122

Metals and metal containing species are used in many areas of chemistry, both for their inherent usefulness and their activity as catalysts for synthesizing many useful molecules and macromolecules. Frequently, the mechanisms and thermochemistry of reactions on metal centers are not well understood. Using ion cyclotron resonance spectroscopy the chemistry of a number of metal and metal containing species with simple organic compounds was studied in the gas phase at pressures where only bimolecular reaction events are observed. Dissert. Abstr.

N78-20277 Delaware Univ., Newark.
STUDIES IN METAL-METAL BONDED SYSTEMS Ph.D. Thesis
Douglas Carlyle Miller 1978 154 p
Avail: Univ. Microfilms Order No. 78-00126

An electronic and structural description of the group 3A-cobalt bond in a series of four-coordinate gallium and indium compounds was obtained from a nuclear quadrupole resonance (NQR) spectroscopy study. These compounds are unique in that both ends of the metal-metal bond may be examined by NQR spectroscopy. A variety of M-Co(CO)4 (M = 1B, 2B, 3A, 4A, and VA metal) systems containing metal-metal bonds were studied by Co-59 NQR spectroscopy, and a qualitative ordering of a Co-M bond covalency was made. A Co-59 NQR study of alkylidynetricobalt nonacarbonyls, RCCO3-(CO)9, was made and the coupling constant was found to correlate with the sigma sub R(-) substituent parameter. This suggests a substantial amount of electron density delocalization in the CCO3 framework as well as some possible conjugative effects between the C-R group and cobalt. Dissert. Abstr.

N78-20278 California Univ., San Diego.
STUDIES IN HYDROGEN EVOLVING SYSTEMS Ph.D. Thesis
Ted Daniel Guth 1977 104 p
Avail: Univ. Microfilms Order No. 7732801

The evolution of hydrogen from protic, mildly alkaline suspensions of Fe(OH)2 at ambient temperature was shown to involve highly dispersed elemental iron as the intermediate, which is generated by way of a base induced disproportionation of Fe(OH)2. The disproportionation reaction also occurs in strongly alkaline suspensions of Fe(OH)2 under these conditions H2 is not formed and elemental iron accumulates in the precipitates instead. Disordered modifications of Fe(OH)2 appear to exist which undergo disproportionation preferentially. The reactive modifications of Fe(OH)2 were formed in higher concentrations or were stabilized by weak complexing or dispersing agents such as simple sugars and polyhydric alcohols, as well as to some extent by Mg(OH)2 or glycine. Dissert. Abstr.

N78-20279 California Univ., Irvine.
EDDY VISCOSITY MODELING IN THE PREDICTION OF COMBUSTION-CHAMBER FLOWS Ph.D. Thesis
Robert Everett Peck 1977 197 p
Avail: Univ. Microfilms Order No. 7801116

The turbulent, reacting flowfield in a backmixed methane/air combustor is modeled analytically by simultaneously solving the governing partial differential conservation equations. An algebraic and a two-equation eddy viscosity model are employed in the numerical simulation to account for the turbulence transport processes. Predicted distributions of isothermal and reacting flow properties are systematically compared to experimentally obtained data to appraise the eddy viscosity models. Hot flow calculations employing a two-step kinetic reaction scheme for the methane oxidation are presented as an indication of the suitability of the eddy viscosity models for predicting turbulent, reacting flows. The results accentuate the inadequate transport characteristics identified in the isothermal flow analysis and verify that considerable testing of the numerical model is required before proceeding to the complicating conditions of combustion. Dissert. Abstr.

N78-20280*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
INTERACTION OF HYDROGEN CHLORIDE WITH ALUMINA Final Report
R. R. Bailey and James P. Wightman Feb. 1978 201 p refs
(Grant NsG-1195)
(NASA-CR-2929) Avail: NTIS HC A10/MF A01 CSCL 07D

The influence of temperature, pressure, and outgas conditions on the absorption of hydrogen chloride and water vapor on both alpha and gamma alumina was studied. Characterization of the adsorbents was performed using X-ray powder diffraction, scanning electron microscopy (SEM), low temperature nitrogen adsorption desorption measurements, BET nitrogen surface area measurements and electron spectroscopy for chemical analysis (ESCA). Water vapor adsorption isotherms at 30, 40, and 50 C were measured on alpha and gamma alumina after outgassing at 80, 200, and 400 C. Both outgas temperature and adsorption temperature influenced the adsorption of water vapor on the aluminas. The water vapor adsorption was completely reversible. Alpha alumina absorbed more water per unit area than gamma alumina. Differences in the adsorption capacity for water vapor of the two aluminas were explained on the basis of ideal surface models of alpha and gamma alumina. Isosteric heats of adsorption for water vapor on the aluminas were determined over a limited range of surface coverage. Author

N78-20281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF NITRIC OXIDE ON PHOTOCHEMICAL OZONE FORMATION IN MIXTURES OF AIR WITH MOLECULAR CHLORINE AND WITH TRICHLOROFLUOROMETHANE
David A. Bittker and Edgar L. Wong Apr. 1978 25 p refs
(NASA-TP-1192; E-9297) Avail: NTIS HC A02/MF A01 CSCL 07D

Ozone formation in a reaction chamber at room temperature and atmospheric pressure was studied for the photolysis of mixtures of NO with either Cl2 or CFCl3 in air. Both Cl2 + NO and CFCl3 + NO in air strongly inhibited O3 formation during the entire 3 to 4 hour reaction. A chemical mechanism that explains the results was presented. An important part of this mechanism was the formation and destruction of chlorine nitrate. Computations were performed with this same mechanism for CFCl3-NO-air mixtures at stratospheric temperatures, pressures, and concentrations. Results showed large reductions in steady-state O3 concentrations in these mixtures as compared with pure air. Author

N78-20282# Texas Univ., Austin. Dept. of Chemistry.
THE DECOMPOSITION OF ETHANOL, PROPANOL AND ACETIC ACID CHEMISORBED ON MAGNESIUM OXIDE Technical Report, 1 Jan. - 31 Dec. 1977
Stephen L. Parrott, J. W. Rogers, Jr., and J. M. White 1 Feb. 1978 30 p refs
(Contract N00014-75-C-0922)
(AD-A050254) Avail: NTIS HC A03/MF A01 CSCL 07/4

Adsorption of ethanol, propanol, and acetic acid on magnesium oxide powder, followed by temperature programmed thermal desorption, yielded the dehydration products ethylene, propylene, and ketene, respectively. Several experiments with ethanol chemisorbed on magnesium oxide doped with various transition metals revealed that such impurities have the effect of lowering the temperature at which ethylene is desorbed. A mechanism is proposed which accounts for dehydration under low pressure conditions and dehydrogenation under high pressure conditions. Author (GRA)

N78-20283# North Carolina Univ., Chapel Hill. William R. Kenan, Jr. Labs. of Chemistry.
CHEMICALLY MODIFIED ELECTRODES. 9: X-RAY PHOTOELECTRON SPECTROSCOPY OF ALKYLAMINESILANES BOUND TO METAL OXIDE ELECTRODES Interim Report
P. R. Moses, Larry M. Wier, John C. Lennox, H. O. Finklea, and J. R. Lenhard Jan. 1978 51 p refs
(Contract N00014-76-C-0817; Grant NSF MPS-75-07863)
(AD-A049660; TR-4) Avail: NTIS HC A04/MF A01 CSCL 11/2

ESCA results are presented for SnO2, RuO2, TiO2, and Pt/PtO oxide electrodes silanized with trialkoxyalkylaminesilanes. Observations include effects of reaction conditions, assay of the fraction of amine-like surface nitrogen, assay of N/Si surface atom ratios, O 1s spectra, and fluoride dopant depth profile in SnO2. The silanized surfaces are amine-like but also exhibit other chemical

features. The implications of various alkylaminesilane surface structures on electrochemical applications are discussed.
Author (GRA)

N78-20284# North Carolina Univ., Chapel Hill. William R. Kenan, Jr. Labs. of Chemistry.
CHEMICAL MODIFICATION OF CARBON ELECTRODES. 10: ESCA AND AC VOLTAMMETRY OF GLASSY CARBON-BOUND TETRA(AMINOPHENYL)PORPHYRINS Interim Report
Royce W. Murray Jan. 1978 27 p refs
(Contract N00014-76-C-0817)
(AD-A049679; TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/4

ESCA data show that tetra (aminophenyl)porphyrin is bound to glassy carbon electrode surfaces by an average of two amide bonds. The bound porphyrin, its Co-metallated analog, and a nitroaromatic bound to the porphyrin via the dangling amine sites, exhibit electrochemical surface waves detected by cyclic, differential pulse and ac voltammetry. Axial coordination of immobilized porphyrin is demonstrated by sensitivity of the electrochemistry to added bases. GRA

N78-20285# Oregon Graduate Center for Study and Research, Beaverton.
MECHANISM SINGLET OXYGEN GENERATION BY CHEMICAL REACTIONS Final Report, 6 Jun. 1975 - 31 May 1977
James K. Hurst 31 Oct. 1977 49 p refs
(Grant AF-AFOSR-2821-75; AF Proj. 2303)
(AD-A050297; AFOSR-78-0113TR) Avail: NTIS HC A03/MF A01 CSCL 07/2

The overall objectives of the present work are to investigate mechanisms of chemical reactions which give rise to electronically excited molecular oxygen and to determine factors responsible for its deactivation in solution, thereby providing the means for optimization of gaseous singlet oxygen formation by homogeneous reaction. Studies have focused upon hypochlorite oxidation of hydrogen peroxide, this reaction having been shown to yield substantial amounts of singlet molecular oxygen. Inasmuch as the redox kinetics were not well-characterized, we have undertaken a thorough analysis of the rate behavior and reaction stoichiometry. Where tractable, measurement of singlet oxygen yields by the various reaction pathways has been made using chemical trapping agents selective for singlet oxygen. Author (GRA)

N78-20286# Wisconsin Univ., Madison. Mathematics Research Center.
MATHEMATICAL THEORY OF LAMINAR COMBUSTION. 1: GOVERNING EQUATIONS
J. D. Buckmaster and G. S. S. Ludford Nov. 1977 28 p refs
(Contract DAAG29-75-C-0024)
(AD-A049382; MRC-TSR-1803) Avail: NTIS HC A03/MF A01 CSCL 21/2

The governing equations of combustion are derived from the standpoint of continuum mechanics; and an indication is given of how their rational analysis can be based on activation-energy asymptotics. Author (GRA)

N78-20287# Wisconsin Univ., Madison. Mathematics Research Center.
THE QUENCHING OF TWO-DIMENSIONAL PREMIXED FLAMES
J. D. Buckmaster Dec. 1977 53 p refs
(Contract DAAG29-75-C-0024)
(AD-A049497; MRC-TSR-1814) Avail: NTIS HC A04/MF A01 CSCL 21/2

An analysis is undertaken, both mathematical and numerical, of the quenching of two-dimensional premixed flames under a variety of circumstances. The discussion is divided into two parts, the first of which deals with quenching due to proximity to a surface through which there are heat losses, the second, quenching due to a shear flow of the kind experienced by a flame attached to a wire. The discussion includes a critical appraisal of flame stretch and the role sometimes claimed for it in intuitive explanations of flame quenching. Author (GRA)

N78-20288# Princeton Univ., N. J. Dept. of Aerospace and Mechanical Sciences.
IGNITION OF FUEL SPRAYS BY INCENDIARY METAL PARTICLES Final Report, 1 Jun. 1976 - 30 Sep. 1977
William A. Sirignano and Howard S. Homan Dec. 1977 38 p refs
(Grant AF-AFOSR-3041-76)
(AD-A050408; AFOSR-78-0150TR) Avail: NTIS HC A03/MF A01 CSCL 21/4

The objective is to provide experimental and theoretical studies which lead to minimization of the fire hazard due to ignition of fuel sprays and vapors by clouds of incendiary metal particles. A literature review shows that much qualitative information is available on this problem, but systematic experimental studies are few. Most of the previous research was in search of 'spark-proof' tools and explanations for coal mine explosions. In general, the metals with higher melting temperature provide the most incendiary sparks from abrasion. Numerical modeling of ignition of a stoichiometric fuel-air mixture by a hot, inert, particle has been completed. The preliminary results show that non-burning used to describe the effects of finite amplitude propagation on the axial time waveforms. A precise theory for the diffraction of the head shock was also presented. The experimental measurements generally confirmed the theoretical predictions. GRA

N78-20289# Sandia Labs., Albuquerque, N. Mex.
THERMAL EXPANSION OF MOLTEN MATERIALS BY THE GAMMA ATTENUATION TECHNIQUE
W. D. Drotning 1977 20 p refs Presented at the Intern. Thermal Expansion Symp., Winnipeg, Canada, 29 Aug. 1977
(Contract EY-76-C-04-0789)
(SAND-77-0626C; Conf-770843-1) Avail: NTIS HC A02/MF A01

An apparatus was constructed for measurement of the density and volumetric thermal expansion of high temperature molten materials using the gamma attenuation technique. It was found that significant improvements in overall experimental precision could be realized by employing an automatic gain control in the linear section of the gamma counting system. The device reduced errors due to system gain shifts and thereby increased the precision of the gamma counting. Corrections were also made for the dead time of the electronics system. A preliminary experimental investigation of the precision of the method was made by measuring small dimensional steps of a tool steel block at a single temperature. ERA

N78-20290# Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.
DETERMINATION OF THE DEVELOPMENT OF A LIQUID PHASE POLYCONDENSATION REACTION BY ELECTRIC POLARIZATION [CARACTERISATION PAR LA POLARIZATION ELECTRIQUE DE L'EVOLUTION D'UNE REACTION DE POLYCONDENSATION DANS LA PHASE LIQUIDE]
D. Dandurand and C. Huraux [1976] 4 p In FRENCH
Avail: NTIS HC A02/MF A01

A nondestructive dosage method, based on electric measurement of a reactive chemical group, for following the development of a polycondensation reaction is proposed. The complex dielectric permittivity in a large frequency range is measured and the results are represented in a d'Argand diagram. The relaxation domains correspond to circle arcs that are more or less separated. In the favorable cases the permittivity values can be extrapolated to the lowest and highest frequencies. The Onsager formula enables the calculation of the number of dipoles per cubic cm. The method was tested with satisfactory results on the epoxy group. ESA

N78-20291# Mississippi Univ., University. Dept. of Chemical Engineering.
THE CONVERSION OF MODEL COAL LIQUIDS COMPOUNDS TO NAPHTHA SPECIES Final Report, 1 Jan. 1973 - 31 Oct. 1976
Henry W. Haynes, Jr. May 1977 201 p refs
(Grants NSF AER-72-03562; NSF GI-36567)
(PB-275891/0; NSF/RA-770322) Avail: NTIS HC A10/MF A01 CSCL 07D

Several catalysts were tested in a laboratory trickle bed reactor for their activities and selectivities in hydrocracking phenanthrene.

All the hydrogenation products of phenanthrene, including high yields of perhydrophenanthrene, were observed in the products from experiments with alumina supported cobalt molybdenum sulfide. In contrast the hydrogenation over chromia-alumina was terminated at symoctahydrophenanthrene. Hydrogenolysis reactions were also observed over these catalysts. The tendency was to successively hydrogenate and crack at terminal rings though some evidence of a minor reaction path involving saturation and cracking at the central ring was observed with chromia-alumina. Author

N78-20292# National Bureau of Standards, Washington, D. C. Center for Fire Research.
A NUMERICAL TECHNIQUE TO CORRECT HEAT RELEASE RATE CALORIMETRY DATA FOR APPARATUS TIME DELAY Final Report
D. D. Evans and L. H. Breden Nov. 1977 26 p refs
(PB-275173/3; NBSIR-77-1302) Avail: NTIS HC A03/MF A01 CSCL 21B

A numerical scheme is presented to correct heat release rate measurements made with the rate of heat release apparatus for the effects of inherent time delays in the measurement system. The magnitude of the correction was shown to increase with increasing rate of change in heat release rate. Illustrative heat release rate curves for particle board and balsa wood show that corrections to the peak heat release rate of 40% and 130% respectively are necessary. Measurements of the apparatus time response to step changes in heat release rate are reported. A simple method of determining corrections to the measured peak heat release rate is discussed. GRA

N78-20293# Princeton Univ., N. J. Dept. of Aerospace and Mechanical Sciences.
AN EXPERIMENTAL INVESTIGATION OF FLAME SPREAD OVER CONDENSED COMBUSTIBLES: GAS PHASE INTERACTIONS Annual Progress Report, 1 Dec. 1976 - 30 Nov. 1977
A. C. Fernandez-Pello Dec. 1977 29 p refs
(Grant NBS-7-9004)
(PB-275999/1; NBS-GCR-78-117) Avail: NTIS HC A03/MF A01 CSCL 21B

Flame spreading over combustible materials was studied to elucidate the role of gas phase heat transfer on flame spread over solid materials. The importance of gas phase convective effects in the energy transfer mechanism, was ascertained. Qualitative measurements of velocities of the order of magnitude of those encountered in the flame spread environment are simply difficult to make using conventional techniques such as pitot tubes or hot wire anemometers. A sophisticated Laser Doppler Velocimeter facility was constructed to undertake the project. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N78-20294 Northwestern Univ., Evanston, Ill.
STRUCTURAL STUDY OF SEVERAL SQUARE-PLANAR PLATINUM METAL COMPLEXES Ph.D. Thesis
Stephen Krogsrud 1977 90 p
Avail: Univ. Microfilms Order No. 77-32322

Results of an investigation of the crystal structure of square planar platinum metal complexes are presented. Lattice constants, cell constants, bond distances, and ligands are among the factors discussed. Dissert. Abstr.

N78-20295 California Univ., Berkeley.
THE REACTION OF A MONONUCLEAR COBALT OXYGEN COMPLEX WITH ACIDS: KINETICS AND MECHANISM Ph.D. Thesis
Joseph John Pignatello 1977 174 p
Avail: Univ. Microfilms Order No. 77-31498

Dioxygen N, N prime-ethylenebis(acetylacetoniminato) (pyridine) cobalt (II) reacts with acids in organic solvents containing excess pyridine to give one-half mole of molecular oxygen, one-half mole of hydrogen peroxide and one mole of dipyridine N, N prime ethylenebis(acetylacetoniminato)cobalt(III) ion as an ion pair with the anion of the acid. In pyridine at or below 0 deg the reaction proceeds very nearly quantitatively and no detectable buildup of intermediates is observed. The reactions of accetic acid in pyridine at -11 deg, studied by monitoring the evolution of gas at constant pressure of oxygen, indicate that only one mechanism is in operation. Addition of tetra-n-butylammonium causes a decrease in the rate, and, when added in large excess, erases the inverse one-half order dependence on the cobalt (III) acetate product. Results with other additives are interpreted in terms of their effect on the hydrogen ion (pyridium ion) concentration. Reactions are discussed in terms of autoxidation of transition metal complexes in general and cobalt complexes in particular. Dissert. Abstr.

N78-20296 Syracuse Univ., N. Y.
THE DETERMINATION OF THE VISCOSITY OF SOME MOLTEN METALS AND ALLOYS BY THE ABSOLUTE METHOD OF OSCILLATIONS Ph.D. Thesis
John Arthur Domingue 1977 137 p
Avail. Univ. Microfilms Order No. 77-30723

Two liquid binary alloy systems were investigated in order to determine their viscosity-composition behavior. Since viscosity is sensitive to intermolecular attraction and to the size of the diffusing particles, it was anticipated that some information could be gained about intermetallic bonding in the liquid state. The viscosities of mercury, lead, thallium, several lead-thallium alloys, and several magnesium-thallium alloys were measured at selected temperatures with an oscillating closed cylindrical crucible viscometer. The method of measurement yielded viscosity values of an absolute nature. That is, for each sample the viscosity was calculated solely from the dimensions of the container, from the period, moment of inertia and logarithmic decrement of the pendulum, and from the density of the liquid. The viscosities so determined are not measured relative to those of any other liquid. Dissert. Abstr.

N78-20297 California Univ., Berkeley.
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AISI 4340 STEEL MODIFIED WITH ALUMINUM AND SILICON Ph.D. Thesis
Manjeshwar Shanthidas Bhat 1977 172 p
Avail: Univ. Microfilms Order No. 7731292

The mechanical properties such as strength, fracture toughness, and impact toughness were obtained for the modified steels in the quenched and tempered condition. The microstructure was characterized using optical and transmission electron microscopy. The fracture surfaces and inclusions were characterized using scanning electron microscopy and an energy dispersive analysis of X-rays unit. It was observed that the softening which normally occurs on tempering AISI 4340 steel was retarded by additions of either aluminum or combinations of aluminum and silicon. Significant improvements in the strength and toughness of quenched and tempered 4340 steel were obtained through silicon and/or aluminum additions. Dissert. Abstr.

N78-20298 Connecticut Univ., Storrs.
AGE HARDENING BEHAVIOR OF TANTALUM-HAFNIUM ALLOYS Ph.D. Thesis
Shun-Tai Chang 1977 91 p
Avail: Univ. Microfilms Order No. 7731065

To understand the age hardening behavior and kinetics of the Ta-Hf system, alloys were aged between 400 and 1125 C for various times until overaging was observed. Microhardness tests, X-ray diffraction, microprobe analysis, and electron microscopy were employed to characterize the properties during aging. Through TEM studies, it was found that the low temperature hardening peak was associated with the formation of dislocation loops, a discovery which was supported by diffusion data. The high temperature hardening peak was attributed to the precipitation hardening which was supported by X-ray studies. Dissert. Abstr.

N78-20299 California Univ., Los Angeles.
THE FATIGUE AND FRACTURE BEHAVIOR OF A LOW STACKING FAULT ENERGY Co-Cr-Mo-C CASTING ALLOY

USED FOR PROSTHETIC DEVICES Ph.D. Thesis
Donald Owen Cox 1977 277 p
Avail: Univ. Microfilms Order No. 7730896

The cast Co-Cr-Mo-C alloy has a metastable crystal structure at room (or body) temperature resulting in a very low stacking fault energy. The effect of this physical characteristic on the mechanical behavior was investigated. The alloy was extensively tested in three material conditions, as-cast (AC), solution treated (ST), and solution treated and aged (STA). The as-cast material consists of a metastable, face centered cubic, cobalt rich matrix with large interdendritic and grain boundary carbides. Fine, spherical, undissolved carbides remain after solution treating and subsequent ageing produces fine carbide precipitation along preferred slip planes of the matrix, as well as blocky grain boundary carbides. Tensile testing of the three materials shows the ST material has lower yield and ultimate strengths than the as-cast, but improved ductility. The STA material has similar tensile properties to the as-cast but inferior ductility. Dissert. Abstr.

N78-20300 California Univ., Berkeley.
ANALYSES OF GRAIN BOUNDARY REACTIONS IN ALUMINUM-ZINC ALLOYS UTILIZING LATTICE IMAGING ELECTRON MICROSCOPY Ph.D. Thesis
Ronald Gronsky 1977 149 p
Avail: Univ. Microfilms Order No. 7731380

Lattice imaging and conventional transmission electron microscopy were applied in an investigation of the relationship between grain boundary structure and boundary-nucleated phase transformations. The study encompassed three reactions associated with grain boundaries in the Al-Zn system: heterogeneous nucleation at grain boundaries, discontinuous precipitation involving the R-phase and the low temperature discontinuous reaction. In conjunction with image computations, lattice images were interpreted using direct fringe spacing measurements, microdensitometer traces, and optical diffraction, providing superior capabilities in structural and chemical analysis. Structural effects at grain boundaries are secondary to the orientation of the boundary plane in promoting effective catalysis of grain boundary precipitation reactions. Dissert. Abstr.

N78-20301 Northwestern Univ., Evanston, Ill.
INTERDIFFUSION AND ENHANCED ELASTIC MODULUS EFFECT IN COMPOSITION MODULATED COPPER-NICKEL THIN FOILS Ph.D. Thesis
Thomas Tsakalakos 1977 202 p
Avail: Univ. Microfilms Order No. 77-32361

Interdiffusivities and biaxial elastic moduli Y(111) were measured in vapor-deposited Cu-Ni foils containing composition modulations with wavelengths between 0.8 and 5 nm. The foils, deposited on mica substrate at 350 C, exhibited a strong (111) texture. The interdiffusivities in the range of 375-450 C, measured from the decay rate of X-ray diffraction satellite intensities, yielded an activation energy which is in good agreement with that obtained by tracer diffusivities measured at higher temperatures. The effective diffusion coefficient at 400 C as a function of the dispersion relation showed a minimum which is indicative of strong long range interactions in the Cu-Ni system. A model, based on the Fourier representation of the harmonic free energy of a binary solid, yielded an expression for the effective diffusion coefficient terms of a power series of the dispersion ratio. Dissert. Abstr.

N78-20302 Case Western Reserve Univ., Cleveland, Ohio.
EFFECTS OF ELECTRON IRRADIATION ON PRECIPITATION IN NICKEL-ALUMINUM, ALUMINUM-SILICON, AND COPPER-IRON ALLOYS Ph.D. Thesis
Heungkyoo Ro 1977 167 p
Avail: Univ. Microfilms Order No. 7731008

A number of alloys were irradiated in situ by high voltage electron microscopy (650 kV) in order to investigate the effects on precipitation. In Al-1 percent Si, precipitation can be induced in solution-treated materials at room temperatures, radiation-enhanced growth of the precipitates is observed, but quantitative data are difficult to obtain because of the complex precipitate morphology. In Ni-Al, nucleation and growth of dislocation loops are observed during irradiations in the temperature range 20 - 500 C. Quantitative analysis shows that the radiation-enhanced diffusion coefficient responsible for the enhanced coarsening of gamma prime is independent of the temperature between 300 and 650 C. In Cu-Fe gamma-Fe precipitates can be transformed to alpha-Fe by cold work but not by electron irradiation at room temperature. Similarly alpha-Fe precipitates are stable up to a dose of 31 dpa. Dissert. Abstr.

N78-20303 Wisconsin Univ., Madison.
A STUDY OF RESISTIVITY INDUCED BY 400 GeV PROTONS IN COPPER AND ALUMINUM Ph.D. Thesis
Phillip Albert Sanger 1977 161 p
Avail: Univ. Microfilms Order No. 77-19783

A theoretical calculation of the displacement damage expected from a 400 GeV proton interaction with copper and aluminum atoms was studied. Both elastic and nonelastic events were considered. The nonelastic events were characterized by a broad spectrum of residual ion masses and energies which were obtained from the MECC-7 Monte Carlo intranuclear cascade modeling program. The total displacement damage from these nuclei, their mean spatial distribution, and the average primary knock-on spectrum were derived from a modified displacement damage code, EDEP1, using the Lindhard theory. This nonelastic contribution was combined with the elastic contribution to give a complete description of the interaction of 400 GeV protons with copper and aluminum. Dissert. Abstr.

N78-20304 Tennessee Univ., Knoxville.
A STUDY OF THE COLD WORKED STATE AND ANNEALING BEHAVIOR OF THE AUSTENITIC STAINLESS STEELS Ph.D. Thesis
Swe-Wong Yang 1977 225 p
Avail: Univ. Microfilms Order No. 7802049

An investigation of the structural changes accompanying cold working and annealing treatments of seven austenitic stainless steels was carried out. The materials studied included five laboratory prepared alloys and two commercial grades of austenitic stainless steels. X-ray line profile analysis were used to measure the stacking fault energies of the seven steels. Transmission electron microscopy combined with the X-ray line profile analysis was used to characterize the cold worked state of the steels. The recovery and recrystallization behavior of the steels were studied with a combination of transmission electron microscopy, hardness measurement, X-ray line profile analysis and measurements of electrical resistivity. The time temperature-precipitation behavior of type 304 steel was also studied. Dissert. Abstr.

N78-20305 State Univ. of New York, Buffalo.
ON THE RELATION BETWEEN DEOXIDATION, NONMETALLIC INCLUSIONS AND MACHINABILITY OF STEELS Ph.D. Thesis
Gloria Moore Faulring 1977 365 p
Avail: Univ. Microfilms Order No. 7732655

The relationship between machinability, tool wear and steelmaking, and the plausible mechanisms of tool wear were examined. It was shown that abrasive wear is the most probable tool wear mechanism controlling tool life and, hence, the relative machinability of steels. The abrasive wear of the tools is due to the presence of oxygen rich nonmetallic inclusions formed in the steels during steelmaking. It is, therefore, possible to vary machinability of steel by controlling the nature and distribution of the oxygen rich minor phases produced during steelmaking. Deoxidation control is a principal means available to exercise this control. To arrive at these conclusions a systematic literature survey as well as analytical and experimental studies were carried out. Thermochemistry of deoxidation and oxygen rich nonmetallic inclusion formation was reviewed. Dissert. Abstr.

N78-20306 Stanford Univ., Calif.
THE PRESSURE SINTERING KINETICS OF IRON POWDERS AND SUPERPLASTIC ULTRAHIGH CARBON STEEL POWDERS Ph.D. Thesis
Robert Domenic Caligiuri 1977 220 p
Avail: Univ. Microfilms Order No. 7802140

The importance of steady state creep mechanisms on the warm temperature pressure sintering kinetics of iron powders and superplastic ultrahigh carbon steel powders during the intermediate stage of densification was determined. By compacting powders at temperatures between 550 C and 700 C at constant applied pressures between 20.7 MPa and 110.3 MPa, it was

shown that powders containing a microstructure known to be superplastic can be pressed in air at warm temperatures and low pressures to virtually full density. Two methods of producing superplastic microstructures in ultrahigh carbon powders were developed. Dissert. Abstr.

N78-20307 Missouri Univ., Rolla.
ANOMALOUS PRETRANSFORMATION DIFFUSION BEHAVIOR OF CARBON IN A FCC IRON-NICKEL INVAR Ph.D. Thesis
Lloyd Rollan Chapman 1977 77 p
Avail: Univ. Microfilms Order No. 78-01703

The temperature dependence of the diffusion coefficient for carbon diffusion in a fcc Fe-29.89 w/o Ni Invar D was obtained over 8 decades from various relaxation time measurements. Combined with published high temperature data, diffusivities over 14 decades of D were available. The resulting Arrhenius plot is distinctly nonlinear and the deviation from linearity is large and comparable in magnitude to that observed for self diffusion in beta-Ti. The deviation from linearity arises predominately from a decrease of the lattice strain energy E sub s. It is suggested that the large diffusion anomaly observed for carbon interstitial diffusion in this alloy is a precursor to the martensitic transformation. Dissert. Abstr.

N78-20308 Marquette Univ., Milwaukee, Wis.
FATIGUE BEHAVIOR OF HARDENED Fe-.3C4-Ni-1Al Ph.D. Thesis
Martin Christian Mataya 1977 222 p
Avail: Univ. Microfilms Order No. 7801926

Light and electron microscopy, low and high cycle fatigue tests, and X-ray line broadening and stress relaxation measurements were used to evaluate fatigue behavior. Three different heat treatments produced the following structure: a conventional quenched and tempered microstructure with a high density of dislocations and elongated carbides, a microstructure of high dislocation density, coarse carbides and fine coherent NiAl precipitates, and a high tempered microstructure with a recovered dislocation substructure, coarse carbides, equiaxed grains, and a fine coherent NiAl precipitate. Dissert. Abstr.

N78-20309 Illinois Inst. of Tech., Chicago.
EFFECT OF COLD WORK AND RETEMPERING ON THE TOUGHNESS OF TEMPER EMBRITTLED STEEL Ph.D. Thesis
Michael John Rowney 1977 251 p
Avail: Univ. Microfilms Order No. 7800880

The Charpy impact test was used to study the effect of cold work on the toughness of AISI grade 5130 steel, which had been quenched and tempered to a hardness of 24 Rc. The principal variables were: as-tempered or temper embrittled condition; tensile, compressive or no cold work; retempering within the embrittlement temperature range, above the embrittlement range, or no retempering step. Supplementary tests included: tensile tests, compression tests, hardness tests, fractography and metallography. The results were interpreted qualitatively in terms of changes in the relative magnitudes of the yield strength and the fracture strength resulting from the superposition of some combination of the following effects: work hardening, the Bauschinger effect, recovery, de-embrittlement, low energy tear, and the aligned weak interface mechanism. Dissert. Abstr.

N78-20310*# California Univ., Berkeley. Lawrence Berkeley Lab.
THE DESIGN OF AN Fe-12Mn-0.2Ti ALLOY STEEL FOR LOW TEMPERATURE USE Final Report
S. K. Hwang and J. W. Morris, Jr. 6 Dec. 1977 107 p
(Grant NGR-05-003-562)
(NASA-CR-135310) Avail: NTIS HC A06/MF A01 CSCL 11F

An investigation was made to improve the low temperature mechanical properties of Fe-8 approximately 12% Mn-O 2Ti alloy steels. A two-phase(alpha + gamma) tempering in combination with cold working or hot working was identified as an effective treatment. A potential application as a Ni-free cryogenic steel was shown for this alloy. It was also shown that an Fe-8Mn steel could be grain-refined by a purely thermal treatment because of its dislocated martensitic structure and absence of epsilon phase. A significant reduction of the ductile-brittle transition temperature was obtained in this alloy. The nature and origin of brittle fracture in Fe-Mn alloys were also investigated. Two embrittling regions were found in a cooling curve of an Fe-12Mn-O 2Ti steel which was shown to be responsible for intergranular fracture. Auger electron spectroscopy identified no segregation during solution-annealing treatment. Avoiding the embrittling zones by controlled cooling led to a high cryogenic toughness in a solution-annealed condition. Author

N78-20311# Northwestern Univ., Evanston, Ill. Technological Inst.
TIME DEPENDENT SOLIDIFICATION OF BINARY MIXTURES
Bruno A. Boley Sep. 1977 11 p refs
(Contract N00014-75-C-1042)
(AD-A049694; TR-1977-1) Avail: NTIS HC A02/MF A01 CSCL 20/12

The problem of change of phase in a binary mixture is considered under arbitrary cooling or heating on the surface. Significantly different behavior is noted between the known solution for a sudden jump in surface temperature and other cooling histories. The solution is presented in series form, and a numerical example is given. Author (GRA)

N78-20312# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
MECHANICAL BEHAVIOR OF TITANIUM ALLOYS: FORMATION BEHAVIOR OF ALPHA/BETA INTERFACE PHASE IN Ti-6Al-4V Technical Report, Feb. 1976 - Feb. 1977
C. G. Rhodes and N. E. Paton 13 Jan. 1978 32 p refs
(Contract N00014-76-C-0598)
(AD-A050473; SC5056-1TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The conditions for formation of the interface phase, or interfacial layer, in Ti-6Al-4V have been studied systematically. The interface phase does not grow during isothermal treatments, but rather only during cooling from elevated temperatures to about 650 C. The width of the interfacial layer is a function of the cooling rate, having a maximum of about 4000 A at 28 C/hr. The interface phase forms initially with an fcc structure which subsequently transforms to hcp alpha phase. A theoretical description of the mechanisms of interface phase formation is presented. Author (GRA)

N78-20313# California Univ., Los Angeles. Dept. of Chemistry.
SYNTHESIS OF CLOSO- AND NIDO-METALLOBORANES FROM METALLOCENES
R. N. Leyden, B. P. Sullivan, R. T. Baker, and M. F. Hawthorne 8 Feb. 1978 53 p refs
(Contract N00014-76-C-0390)
(AD-A050422; TR-101; CONTRIB-3916) Avail: NTIS HC A04/MF A01 CSCL 07/2

Two general methods have been developed for the synthesis of nido- and closo-metalloboranes. The first method is termed nido-cage closure. The nido-borane species 'closes' around the metal atom of the metallocene reagent with expulsion of a cyclopentadienyl moiety. This process may occur with or without loss of molecular hydrogen or possibly by hydride transfer to the cyclopentadienyl ligand and has many precedents in metallocarborane syntheses. The second route to closo-metalloboranes may be classified as polyhedral expansion of closo-borane anions. GRA

N78-20314# California Univ., Los Angeles. Dept. of Chemistry.
STRUCTURES OF METALLOCARBORANES. 8: CRYSTAL AND MOLECULAR STRUCTURE OF THE ELEVEN-VERTEX HETEROBIMETALLOCARBORANE 1,8-DI-ETA-CYCLOPENTADIENYL-1-FERRA-8-COBALTA-2,3 UNDECABORANE(9), 1,8-(ETA-C5H5)2-1-Fe-8-Co-2,3-C2-B7H9(1) Interim Report
K. P. Callahan, A. L. Sims, C. B. Knobler, F. Y. Lo, and M. F. Hawthorne 18 Nov. 1978 37 p refs
(Contract N00014-76-C-0390)
(AD-A050326; TR-99-8; Contrib-3914-8) Avail: NTIS HC A03/MF A01 CSCL 07/3

Polyhedral metallocarboranes containing two different transition metal vertices can be prepared by use of either polyhedral expansion or polyhedral subrogation reactions on previously prepared metallocarboranes. To assess the effect of a one electron deficiency, the X-ray structural determination of (C5H5)2FeCoC2B7H9 was undertaken. GRA

N78-20315# Naval Postgraduate School, Monterey, Calif.
MICROSTRUCTURAL RESPONSE OF ALUMINUM-MAGNESIUM ALLOYS TO THERMOMECHANICAL PROCESSING M.S. Thesis
Charles Pierson Bingay Dec. 1977 101 p refs
(AD-A049949) Avail: NTIS HC A06/MF A01 CSCL 11/6

Mechanisms of microstructural refinement in aluminum-magnesium alloys were investigated. Alloys containing from 15% to 19% magnesium were exposed to various processing schemes, and the resulting microstructures were examined. Isothermal forging resulted in some refinement depending on the temperature, strain and strain rate. However, all samples isothermally forged exhibited microstructures having relatively large amounts of the brittle intermetallic phase present. The addition of tertiary alloy elements resulted in little improvement in microstructure. Non-isothermal schemes resulted in the most promising microstructures. A process of high temperature soaking followed by deformation at relatively lower temperatures is concluded to be the most promising means for processing alloys with magnesium contents below 15% by weight. GRA

N78-20316# Army Materials and Mechanics Research Center, Watertown, Mass.
BALLISTIC BEHAVIOR OF ALUMINUM ALLOY LAMINATES Final Report
Stuart V. Arnold Oct. 1977 42 p
(AD-A050199; AMMRC-TR-77-24) Avail: NTIS HC A03/MF A01 CSCL 01/3

Fragment penetration of monolithic plate and resin-bonded sheet laminates of aluminum alloy 7475-T371, all of equivalent areal density, is reported as a function of velocity, obliquity, and laminate design. Fragment-simulating projectiles weighing 5.85 and 17.0 grains were used in ballistic tests over ranges of velocity comparable to those attained by actual fragments of 23-mm HEI shell. Findings are discussed with relation to aircraft vulnerability. Author (GRA)

N78-20317# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
ION MICROPROBE ANALYSIS OF CATHODE NICKEL ALLOYS Interim Report
F. M. Wachi, N. Marquez, and J. R. Shepherd Oct. 1977 29 p refs
(Contract F04701-77-C-0078)
(AD-A050168; TR-0078(3403-02)-1; SAMSO-TR-77-183) Avail: NTIS HC A03/MF A01 CSCL 09/1

An ion microprobe technique of analysis for manganese and other potentially detrimental impurities in machined cathode nickel alloy buttons is described. This nondestructive method does not jeopardize the subsequent performance characteristics of the nickel alloy pellet as a substrate for the barium-strontium oxide emitter material. This analytical technique is currently used as a standard quality assurance/quality control procedure in the fabrication of cathode assemblies of traveling-wave tubes for space applications. Author (GRA)

N78-20318# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
STRESS CORROSION CRACKING AND HYDROGEN EMBRITTLEMENT: DIFFERENCES AND SIMILARITIES
R. M. Latanision, O. H. Gastine, and C. R. Compeau Jan. 1978 26 p refs
(Contract N00014-78-C-0002; NR Proj. 036-127)
(AD-A050189; TR-1) Avail: NTIS HC A03/MF A01 CSCL 11/6

Over the years many criteria have been proposed for distinguishing, phenomenologically at least, stress corrosion cracking from hydrogen embrittlement. At one time, for example, the susceptibility of an alloy to cracking at anodic potentials was considered characteristic of a material sensitive to SCC. Conversely, increased sensitivity at cathodic potentials was considered evidence of HEM. This potential dependence is clearly an uncertain criterion since it is now appreciated that crack tip conditions (potential and pH) may vary considerably from those more easily measured at the bulk metal/electrolyte interface. In this discussion, we will trace the development, and dismissal in some cases, of various criteria for distinguishing SCC from HEM based on, for example, hydrogen-induced phase transformations in the solid, the observation of hydrogen evolution from the tip of a propagating crack, fractography, crystal structure, critical anionic species in the electrolyte, loading mode during deformation, and the influence of solid state impurities. Author (GRA)

N78-20319# Naval Postgraduate School, Monterey, Calif.
GALVANIC ASPECTS OF ALUMINUM SACRIFICIAL ANODE ALLOYS IN SEAWATER M.S. Thesis
Jon Richard Cummings Dec. 1977 171 p refs
(AD-A050273) Avail: NTIS HC A08/MF A01 CSCL 11/6

Galvanic aspects of aluminum sacrificial anode alloys in artificial seawater were investigated. Specifically, two mercury-bearing alloys and one tin-bearing alloy were studied. The polarization behavior of the aluminum sacrificial anode alloys coupled to HY-80 steel is discussed. Current versus time curves were obtained for aluminum/steel galvanic couples immersed in arttificial seawater for specific intervals. Scanning electron microscopy was used to characterize the anode dissolution patterns and the corrosion mechanisms. A correlation is made between the dissolution morphologies exhibited by each anode alloy and the polarization and galvanic current data.
Author (GRA)

N78-20320# California Univ., Berkeley. Lawrence Berkeley Lab.
INVESTIGATION OF HYDROSTATIC EXTRUSION AND DEFORMATION MODES FOR THE FABRICATION OF MULTIFILAMENTARY NIOBIUM-TIN SUPERCONDUCTORS BY A POWDER METALLURGY APPROACH M.S. Thesis
Glen Earl MacLeod Jun. 1977 55 p refs
(Contract W-7405-eng-48)
(LBL-6622) Avail: NTIS HC A04/MF A01

Various aspects of a powder metallurgy approach to fabricate filamentary niobium-tin superconducting wire were investigated. Difficulties occurred due to lack of complete tin infiltration of the sintered niobium rod, formation of intermetallics during infiltration, and both cladding, and core fracture during mechanical reduction. The influence of sintering time, infiltration temperature, and deformation mode was investigated. Progress is reported on the clarification of the role of several of the important process parameters. ERA

N78-20321# Argonne National Lab., Ill. Materials Science Div.
HIGH-TEMPERATURE DEFORMATION AND RUPTURE BEHAVIOR OF INTERNALLY-PRESSURIZED ZIRCALOY-4 CLADDING IN VACUUM AND STEAM ENVIRONMENTS
H. M. Chung, A. M. Garde, and T. F. Kassner 1977 28 p refs Presented at the Thermal Reactor Safety Meeting, Sun Valley, Idaho, 31 Jul. 1977
(CONF-770708-16) Avail: NTIS HC A03/MF A01

The high-temperature diametral expansion and rupture behavior were investigated under transient-heating conditions that are of interest in hypothetical loss of coolant accident situations in light water reactors. The effects of internal pressure, heating rate, axial constraint, and localized temperature nonuniformities in the cladding on the maximum circumferential strain have been determined for burst temperatures between approximately 650 and 1350 C. ERA

N78-20322# Standard Pressed Steel Labs., Naas (Ireland).
APPLIED RESEARCH PROGRAMME ON LUBRICATION OF TITANIUM BOLTS. REPORT ON IVD ALUMINIUM
J. Newnham, K. Singh, and L. Curley Paris ESA Oct. 1977 31 p refs
(Contract ESTEC-2670/76-NL-PP(SC))
(SPS-5229-4; ESA-CR(P)-1020) Avail: NTIS HC A03/MF A01

Work is reported on the identification of a coating/lubricant combination for titanium alloy fasteners, to give predictable frictional conditions on repeated installations and to be com-

patible with environmental conditions, both in space and on the ground. Ion vapor deposited (IVD) aluminum coatings were evaluated. The coatings examined were of the conventional or soft type, and also the hard type, where diffusion into the titanium substrate is allowed. Coating thickness was evaluated, and torque-tension tests conducted under lubricated and unlubricated conditions. Neither of the IVD coatings evaluated appeared to offer any advantages over the aluminum paint coating examined previously. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N78-20323 Clarkson Coll. of Technology, Potsdam, N.Y.
SOLVENT CAGES AND RANDOM CHAIN SCISSION OF POLYMERS Ph.D. Thesis
James J. Lichorat 1977 233 p
Avail: Univ. Microfilms Order No. 77-30341

Rate constants for main chain scission for frictionated samples of polyisobutene, poly-(n-butylmethacrylate), poly(alpha-methylstyrene), and polymethacrylic acid were determined as a function of solvent viscosity, chain length, and chain configuration. Chain scission was induced by ultraviolet radiation in a deoxygenated environment. Viscometric techniques were used for measuring the degree of degradation. The theories of polymer chain distribution and random chain scission were employed to calculate the experimental rate constants from the data. Reaction schemes and rate expressions were given for chain scission in terms of solvent cage reactions. Dissert. Abstr.

N78-20324 Missouri Univ., Columbia.
EFFECTS OF MOLDING VARIABLES, GLASS-FIBER REINFORCEMENT AND AGING ON THE FATIGUE BEHAVIOR OF POLYCARBONATE IN AQUEOUS AND SALINE ENVIRONMENTS Ph.D. Thesis
Inder Kumar Magoon 1977 176 p
Avail: Univ. Microfilms Order No. 77-31741

The effects of molding temperatures, glass fiber reinforcement, stress concentration, aging, and saline environment on the fatigue behavior of injection molded polycarbonate were investigated. Fatigue tests were made with specially designed machines in which statistical samples of specimens were subjected to alternating fluid loading. The fluid loading permitted temperature control, high testing speeds, and aqueous or other environments. The fatigue lives fell on Weibull distributions with nonzero minimum life parameters. S-N equations were fitted at 5%, 50% and 95% probabilities of failure. Dissert. Abstr.

N78-20325 Case Western Reserve Univ., Cleveland, Ohio.
IN-SITU STUDIES OF ELECTRON IRRADIATION DAMAGE IN CERAMIC OXIDES USING HIGH-VOLTAGE ELECTRON MICROSCOPY Ph.D. Thesis
Robert Stanley Barnard 1977 149 p
Avail: Univ. Microfilms Order No. 7730973

Measurements of the threshold energy for displacement were performed on MgO as a function of orientation and temperature. Irradiations conducted at elevated temperatures in MgO resulted in the formation of dislocation loops. Irradiation induced sublimation of the MgO samples was noted, as well as the faceting of the sample surfaces facing away from the incident electron beam. Condensation of the sublimate resulted in polycrystalline MgO in the irradiated regions of the foil. Similarly produced precipitates of MgO were found in Mg_2SiO_4 and $MgAl_2O_4$ during electron irradiation at elevated temperatures. Al_2O_3 irradiated at elevated temperatures resulted in loop formation. High dose irradiations at elevated temperatures also revealed dislocation loop elongation. Dissert. Abstr.

N78-20326 Northwestern Univ., Evanston, Ill.
LINEAR VISCOELASTIC STUDIES ON MELTS OF HYDROGENATED NARROW DISTRIBUTION POLYBUTADIENES Ph.D. Thesis
Gregory George Smith 1977 230 p
Avail: Univ. Microfilms Order No. 77-32351

Narrow distribution polybutadienes prepared by an anionic polymerization method were hydrogenated using a homogeneous coordination catalyst. Comparison of dilute solution molecular characterization data on the parent and hydrogenated polymers indicated that the hydrogenation was accompanied by a more or less severe alteration of the molecular weight distribution, involving primarily chain scission. The dynamic shear moduli were measured on the hydrogenated polybutadiene (HPB) melts and related to the intermolecular relaxation spectrum. It was found that this spectrum had two distinguishable components: a primary component associated with disentanglement processes, having the characteristic activation energy of unaltered HPB; and a secondary component, spanning longer relaxation times and larger activation energies than the primary component. Dissert. Abstr.

N78-20327 Connecticut Univ., Storrs.
WEAR AND DEGRADATION OF POLYMERS AND POLYMERIC COMPOSITE MATERIALS Ph.D. Thesis
Paresh Jaswantlal Sheth 1977 289 p
Avail: Univ. Microfilms Order No. 77-31220

Wear testing was a critical part of the investigations into the physical and mechanical properties of polymeric dental composite materials subject to any of the various types of wearing forces in the mouth. The composites that were tested and evaluated differ in their particle size and particle size distribution of the filler. In examining various conflicting theories of wear, it seems reasonable that a recently proposed theory, the delamination theory of wear, may offer perhaps the best framework for interpreting wear results. Measurements using a sliding wear tester provided an incisive test of wear experienced by a new class of materials, namely dental composites. Dissert. Abstr.

N78-20328 Pittsburgh Univ., Pa.
CRYSTALLIZATION - MORPHOLOGY - MECHANICAL BEHAVIOR OF SOME SILOXANE BLOCK COPOLYMERS Ph.D. Thesis
Hin-Mo Li 1977 185 p
Avail: Univ. Microfilms Order No. 7723557

A study of the interrelationships between composition, crystallization kinetics, morphology and mechanical behavior was conducted on random block copolymer system of tetramethyl-p-silphenylene-siloxane (TMPS) and dimethyl-siloxane (DMS). An understanding of the importance of thermoplastic elastomeric materials and their properties which may be related to processing conditions is presented. For copolymers having contents ranging from 50% to 70% typical thermoplastic behavior is obtained. The value of the storage Young' modulus changes from 10 to the 10th power -10 to the 11th power dynes per square cm in the glassy region to 10 to the 6th power - 10 to the 7th power dynes per square cm in rubbery region. The crystalline TMPS phase functions both as a crosslinking agent and as a filler for the rubbery DMS component which also has some TMPS in amorphous phase. All dynamic mechanical properties are functions of composition and crystallinity. Specifically, the level of the rubbery plateau in these thermoplastic materials is higher for specimens with higher crystallinity. Dissert. Abstr.

N78-20329 Purdue Univ., Lafayette, Ind.
HIGH PERFORMANCE LIQUID CHROMATOGRAPHY OF MACROMOLECULES Ph.D. Thesis
Rodney Joseph Noel 1977 144 p
Avail: Univ. Microfilms Order No. 77-30115

Controlled porosity glass has provided a basis for an ideal inorganic support for the high performance liquid chromatography of macromolecules. However, nonspecific adsorption limited its utility in separation of biological macromolecules. Adsorption on active silaceous surfaces was controlled by covalently bonding a variety of carbohydrate materials to the support surface. Low molecular weight dextran and glycidyl silane supports were found to be very successful in preventing protein adsorption to a silica surface. The glycidylpropyl silane supports were found to be most useful in steric exclusion chromatography. Various polymers and protein mixtures were separated using this support. Due to the gradual erosion of surface bonded phases in basic media, an effort was made to increase bonded phase stability.
Dissert. Abstr.

N78-20330 Missouri Univ., Rolla.
A STUDY OF MECHANICAL DEGRADATION OF HIGH MOLECULAR WEIGHT POLYMERS IN DILUTE SOLUTION UNDER CONTROLLED HYDRODYNAMIC SHEAR Ph.D. Thesis
Feng-Shing Yu 1977 205 p
Avail: Univ. Microfilms Order No. 7801706

The mechanical shear degradation of polydisperse polyvisobutene and monodisperse polystyrene in different viscosities of oils in the concentration range from 0.1 percent to 1 percent was studied using a high-shear concentric cylinder viscometer under laminar and uniform well-defined shear field conditions. Degradation of polydisperse polyisobutene solutions narrows the distributions principally through the breaking down of large molecules. Degradation of monodisperse polystyrene widens the distributions at lower shear stresses. At higher shear stresses, the distribution is not as broad but is still broader than the original polymer. It was found that the extent of degradation has a negative concentration dependence coefficient at relatively high molecular weight and a positive concentration dependence at lower molecular weight. The degradation data indicate that the shear stress is the controlling parameter; not shear rate. The shear degradation is independent of initial molecular weight and viscosity of the solvent. Dissert. Abstr.

N78-20331 Case Western Reserve Univ., Cleveland, Ohio.
RADIATION INDUCED SOLID STATE POLYMERIZATION IN BULK AND IN ORIENTED ULTRATHIN FILMS Ph.D. Thesis
Asis Banerjie 1977 310 p
Avail: Univ. Microfilms Order No. 78-00551

Infrared spectroscopic investigation of the solid state polymerization of a number of conjugated diacetylenes was done and a number of bands were used to follow the polymerization mechanism, side chain packing, morphology and phase changes. A solid solution through the entire range of polymerization and a phase change from a monomer rich phase to a polymer rich phase was observed with heptadecadiyne-2,4-Acid-1, heptadecadiyne-2,4-OL-1, heptadecadiyne-4,6-Acid-1. A number of multilayers with unusual structures were prepared and their side chain packing was characterized by X-ray diffraction studies. An interesting example is the head-tail form of the Cd+2 salt of poly(octadecylacrylic acid). Dissert. Abstr.

N78-20332 North Carolina State Univ., Raleigh.
DYNAMIC MODULI OF CONTINUOUS FILAMENT YARNS SUBJECTED TO LOW FREQUENCY EXCITATION SUPERIMPOSED ON HIGH INITIAL LONGITUDINAL STRAIN Ph.D. Thesis
Zan Prevost Smith 1977 134 p
Avail: Univ. Microfilms Order No. 7729645

The effective dynamic mechanical properties of twisted yarn were related to the dynamic mechanical properties of the constituent filaments and the geometry of the filaments in the structure. The analysis included the following principle assumptions: (1) the dynamic longitudinal strain imposed is propagated as a plane wave in the twisted yarn structure, (2) filament locations within the yarn structure are constant radius helical paths, (3) filament dynamic mechanical properties are represented by the generalized Maxwell model, (4) filament to filament interactions with the yarn structure are represented by a simple Coulomb friction model. Experiments performed on 70 denier, 34 filament Nylon 66 using a viscoelastometer indicate that yarn dynamic mechanical properties are predictable in terms of the dynamic mechanical properties of the filaments and the geometry of the yarn structure if sufficient static strain is imposed to eliminate Coulomb friction effects. Dissert. Abstr.

N78-20333*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COATINGS FOR WEAR AND LUBRICATION
Talivaldis Spalvins 1978 32 p refs Presented at the 3d Intern. Conf. on Metallurgical Coatings, San Francisco 3-7 Apr. 1978; sponsored by Am. Vacuum Soc. Inc.
(NASA-TM-78841) Avail: NTIS HC A03/MF A01 CSCL 11G

Recent advances in the tribological uses of rf-sputtered and ion plated films of solid film lubricants (laminar solids, soft metals, organic polymers) and wear resistant refractory compounds (carbides, nitrides, silicides) are reviewed. The sputtering and ion plating potentials and the corresponding coatings formed were evaluated relative to the friction coefficient, wear endurance life and mechanical properties. The tribological and mechanical properties for each kind of film are discussed in terms of film adherence, coherence, density, grain size, morphology, internal stresses, thickness, and substrate conditions such as temperature, topography, chemistry and dc-biasing. The ion plated metallic films in addition to improved tribological properties also have better mechanical properties such as tensile strength and fatigue life. Author

N78-20334*# Bowie State Coll., Md.
CHARACTERIZATION OF THE PHYSICO-CHEMICAL PROPERTIES OF POLYMERIC MATERIALS FOR AEROSPACE FLIGHT Annual Report
Michael Rock 17 Mar. 1978 85 p
(Grant NsG-5009)
(NASA-CR-156116) Avail: NTIS HC A05/MF A01 CSCL 11G

Polymers were tested and allowed to outgas isothermally at 125 C and .000001 torr or less. The performance was investigated by thermogravimetric analysis from room temperature to 450 C or until the substance decomposed. Author

N78-20335*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN EVALUATION OF GREASE TYPE BALL BEARING LUBRICANTS OPERATING IN VARIOUS ENVIRONMENTS Status Report
E. L. McMurtrey Mar. 1978 32 p refs
(NASA-TM-78162; SR-3) Avail: NTIS HC A03/MF A01 CSCL 13I

Because many future spacecraft or space stations will require mechanisms to operate for long periods of time in environments which are adverse to most bearing lubricants, a series of tests is continuing to evaluate 29 grease type lubricants in R-4 size bearings in five different environments for a 1 year period. Four repetitions of each test are made to provide statistical samples. These tests have also been used to select four lubricants for 5 year tests in selected environments with five repetitions of each test for statistical samples. At the present time, 65 test sets have been completed and 23 test sets are underway. Two (5 year) tests have already been started in (1) continuous operation and (2) start-stop operation, with both in vacuum at ambient temperatures. To date, in the 1 year tests, the best results in all environments have been obtained with a high viscosity index perfluoroalkylpolyether grease. Author

N78-20336*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
X-RAY PHOTOELECTRON SPECTROSCOPY STUDY OF RADIOFREQUENCY-SPUTTERED REFRACTORY COMPOUND STEEL INTERFACES
Donald R. Wheeler and William A. Brainard Feb. 1978 20 p refs
(NASA-TP-1161; E-9374) Avail: NTIS HC A02/MF A01 CSCL 11G

Radiofrequency sputtering was used to deposit Mo2C, Mo2B5, and MoSi2 coatings on 440C steel substrates. Both sputter etched and preoxidized substrates were used, and the films were deposited with and without a substrate bias of -300 V. The composition of the coatings was measured as a function of depth by X-ray photoelectron spectroscopy combined with argon ion etching. In the interfacial region there was evidence that bias produced a graded interface in Mo2B5 but not in Mo2C. Oxides of iron and of all film constituents except carbon were presented in all cases but the iron oxide concentration was higher and the layer thicker on the preoxidized substrates. The film and iron oxides were mixed in the MoSi2 and Mo2C films but layered in the Mo2B5 film. The presence of mixed oxides correlates with enhanced film adhesion. Author

N78-20337*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION AND FAILURE MECHANISMS OF GRAPHITE FLUORIDE FILMS
Robert L. Fusaro Apr. 1978 32 p refs

(NASA-TP-1197; E-9346) Avail: NTIS HC A03/MF A01 CSCL 11H

An optical microscope, equipped with a vertical illuminator and two polaroid filters (one rotatable), was used to visually study 440C HT steel surfaces lubricated with rubbed graphite fluoride films. Friction and wear results were compared to visual observations as a function of sliding distance for films applied to three surface finishes - polished, sanded, and sand-blasted. In general, the lubricating process was one of initial deformation or wear of metallic asperities into flat plateaus and then the formation of thin, layer-like, dynamic films which sheared between the flats and eventually flowed through the contact area. Failure was due to depletion of the graphite fluoride with the subsequent formation of excessive powdery metallic debris that formed a heavy, powdery film on both the rider and disk surfaces. Author

N78-20338*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTION AND WEAR OF RADIOFREQUENCY-SPUTTERED BORIDES, SILICIDES, AND CARBIDES

William A. Brainard and Donald R. Wheeler Apr. 1978 19 p refs

(NASA-TP-1156; E-9384) Avail: NTIS HC A02/MF A01 CSCL 11G

The friction and wear properties of several refractory compound coatings were examined. These compounds were applied to 440 C bearing steel surfaces by radiofrequency (RF) sputtering. The refractory compounds were the titanium and molybdenum borides, the titanium and molybdenum silicides, and the titanium, molybdenum, and boron carbides. Friction testing was done with a pin-on-disk wear apparatus at loads from 0.1 to 5.0 newtons. Generally, the best wear properties were obtained when the coatings were bias sputtered onto 440 C disks that had been preoxidized. Adherence was improved because of the better bonding of the coatings to the iron oxide formed during preoxidation. As a class the carbides provided wear protection to the highest loads. Titanium boride coatings provided low friction and good wear properties to moderate loads. Author

N78-20339# Thames Polytechnic, London (England). School of Chemistry.

NEW POLYORGANOSILOXANES PREPARED FROM SILICATE MINERALS Final Technical Report, Mar. - Aug. 1977

B. R. Currell Aug. 1977 46 p refs

(Grant DA-ERO-74-G-019)

(AD-A049709) Avail: NTIS HC A03/MF A01 CSCL 07/3

Several novel polyorganosiloxane systems have been prepared by the physical and chemical modification of inorganic polymers resulting from the trimethylsilylation of minerals such as biotite, muscovite, thuringite and wollastonite. The extensive study of the trimethylsilylation step itself has given detailed information about the isomorphous replacement of silicon by aluminium in the silicate backbone, and the polymers produced by this step are interesting in themselves, showing marked stability to acid and base attack. The modification of this initial or pre-polymer by a variety of physical and chemical techniques has led to a number of interesting systems: (1) thermal polymerisation gives high molecular weight products with molecular wt. of approx. 6000; (2) reaction through pendant hydroxyl groups with (CH3)3SiCl, Ph2PCl, SOCl2, (Ch2=CH)(CH3)SiCl2, CH2=C-HSiCl2 gives functionally substituted polyorganosiloxanes; and (3) reaction with (CH3)2SiCl2 in the presence of hydrated ferric chloride gives products with molecular wt. of approx. 6000 containing labile chlorine atoms. Finally, the reactivity of the methyl groups (CH3)3Si on the polyorganosiloxanes was investigated and it was shown that they will react to give halogen precursors which can be used to give polyorganosiloxanes containing alcoholic and ester groupings. Author (GRA)

N78-20340# Union Carbide Corp., Tarrytown, N.Y.

ORGANOSILANE POLYMERS. 1: POLY (DIMETHYLSILYLENE)

J. P. Wesson and T. C. Williams Dec. 1977 30 p refs Submitted for publication

(Contract N00014-75-C-1024)

(AD-A050337; TR-77-1) Avail: NTIS HC A03/MF A01 CSCL 11/9

Poly(dimethylsilylene) higher polymers prepared by alkali metal coupling of purified dimethyldichlorosilane were found to be high melting largely crystalline polymers which were soluble in solvents only at temperatures above 200 C. Author (GRA)

N78-20341# Ceramic Finishing Co., State College, Pa.

LOCALIZED IMPACT DAMAGE IN CERAMICS Technical Report, 1 Feb. 1977 - 31 Jan. 1978

Kirchner H. P., Robert M. Gruver, and James W. Kirchner Jan. 1978 125 p refs

(Contract N00014-74-C-0241)

(AD-A050357) Avail: NTIS HC A06/MF A01 CSCL 11/2

The following topics are covered in this report: (1) the effect of localized impact damage on energy losses during impact; (2) analysis of localized impact damage in biaxially stressed glass plates; (3) localized impact damage in stressed H. P. Si3N4 and 94% Al2O3; (4) the shapes of mirror-mist and crack branching boundaries; (5) the strain intensity criterion for crack branching in ceramics. Author (GRA)

N78-20342# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.

THE MECHANICAL BEHAVIOR OF HIGH IMPACT POLYSTYRENE UNDER PRESSURE

John S. Trent, Mervyn J. Miles, and Eric Baer 15 Jan. 1978 45 p refs

(Contract N00014-75-C-0795)

(AD-A050157; TR-6) Avail: NTIS HC A03/MF A01 CSCL 11/9

High-impact polystyrene (HIPS), a two-phase polymeric system, has been investigated studying the pressure dependence of stress-elongation behavior in tension over the range from atmospheric pressure to four kilobars at room temperature and constant strain rate. A comparative study of polystyrene (PS) was also undertaken. HIPS sealed from the environment exhibited ductile behavior at all pressures. Surprisingly, specimens exposed to silicon oil environment exhibited two transitions as the applied hydrostatic pressure was raised: a ductile-to-brittle followed by a brittle-to-ductile transition. Stress-whitening was suppressed at relatively low pressures. The dilational requirement for profuse crazing was restrained by the combined effect of fluid under pressure resulting in the suppression of the energy absorption mechanism. Analysis of the stress-elongation curves for sealed specimens indicated that the pressure dependency of craze-initiation stress differs from that of shear band initiation stress. The brittle-to-ductile transition occurred when the initiation stresses of both processes became equal. The principal stress for craze initiation showed almost no pressure dependency. GRA

N78-20343# Monsanto Research Corp., Dayton, Ohio.

FLAME- AND SMOKE-RETARDANT POLYMER SYSTEMS Final Report, May 1976 - Sep. 1977

Leo Parts, Robert D. Myers, Catherine A. Thompson, and Norman F. May 3 Feb. 1978 152 p refs

(Contract N00024-76-C-5336)

(AD-A049923; MRC-DA-722) Avail: NTIS HC A08/MF A01 CSCL 11/9

Means for enhancing the fire safety of molded polyvinyl chloride (PVC) and neoprene foam were explored. These included incorporation of fire- and smoke-retardant additives into both polymer systems and the use of intumescent coatings with the PVC system. GRA

N78-20344# Defence Research Establishment, Ottawa. (Ontario). Environmental Protection Section.

APPLICATION OF ULTRASOUND AND MICROWAVES DURING TREATMENT OF FABRICS WITH LIQUID-REPELLENT FINISHES

John M. McAndless, Benoit V. Lacroix, Anthony J. Last, and Ted W. Hislop Oct. 1977 47 p refs

(AD-A046387; DREO-R-764) Avail: NTIS HC A03/MF A01 CSCL 11/5

Two types of military fabric were treated with a liquid-repellent fluorochemical finish in the presence of high-frequency sonic energy (ultrasound) over a range of frequencies and power levels. Fabric properties such as physical strength, liquid repellency, and durability of repellency to laundering and wearing were evaluated following treatment to determine the effects of using ultrasound

during the finishing process. A second series of tests was carried out to determine whether microwave energy could be employed for the purpose of ensuring a more uniform impregnation of the fabrics, as well as to accelerate the drying and curing processes. Author (GRA)

N78-20345# University Coll. of Swansea (Wales). Tribology Centre.
MOLYBDENUM DISULPHIDE LUBRICATION. A CONTINUATION SURVEY 1975-76
A. R. Lansdown 1977 93 p refs
(Contract ESTEC-2261/74)
(STC-77/363) Avail: NTIS HC A05/MF A01

A literature study on molybdenum disulfide lubrication covering the years 1975 to 1976 is presented. The following aspects are dealt with: history of MoS2 as a lubricant; chemical and physical properties; mechanism of lubrication; lubrication by MoS2 alone; bonded films; incorporation in bulk solids; use in oils and greases; other related dichalcogenides; design guidance and performance prediction; corrosion; and quality control and performance testing. ESA

N78-20346# Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.
STUDY OF WOOL, PAPER, AND POLYPROPYLENE FIBER TRANSFORMATION BY ELECTRIC DISCHARGES AT HIGH PRESSURE Annual Report [ETUDE DE LA TRANSFORMATION DE FIBRES DE LAINES DE PAPIER ET DE POLYPROPYLENE PAR L'ACTION DES DECHARGES ELECTRIQUES A HAUTE PRESSION]
C. Mayoux and B. Benaissa Apr. 1976 28 p In FRENCH
Sponsored by Elec. de France
(Publ-290) Avail: NTIS HC A03/MF A01

Infrared spectra of wool, cellulose, and polypropylene fibers with and without electric discharge treatment were recorded and analyzed. In addition a calorimetric microanalysis was made using a Perkin Elmer DSC 1B, which revealed a modification of the dehydration temperature, especially of the textile fibers. A preliminary test on treated paper enabled the study of the behavior of this material as a function of the time of treatment and also of the permanent nature of the transformation. ESA

N78-20347# Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.
SYNTHESIS OF POLYSTYRENE THIN LAYERS BY POLYMERIZATION IN THE GAS PHASE FOR CAPACITOR DIELECTRICS [SYNTHESE DE COUCHES MINCES DE POLYSTYRENE PAR POLYMERISATION EN PHASE GAZEUSE POUR DIELECTRIQUE DE CONDENSATEURS]
15 Dec. 1976 6 p In FRENCH
(Contract DRME-75.34.4640048075-01)
Avail: NTIS HC A02/MF A01

A prototype capacitor with a thin layer polystyrene dielectric obtained by electric discharge was developed. Aim was to improve the loss factor tg delta of the layers. Purification of the monomer did not lead to the required improvement. ESA

N78-20348# Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.
POLYMERIZED DEPOSITS IN PLASMA EQUIPMENT [LES DEPOTS POLYMERISES PAR PLASMA]
Robert Lacoste Sep. 1976 50 p refs In FRENCH Presented at the Summer School Reactions Atomiques et Mol. dans les Gaz Ionises, Les Houches, France, Aug. 1976
Avail: NTIS HC A03/MF A01

In numerous experiments involving plasmas solid deposits are found which are often a nuisance and which have to be removed periodically. Analysis however, has revealed interesting properties: chemical stability, substrate adhesion, ease of production. A survey of the production, characterization, and application of these solids is presented. Topics include influence of the deposition parameters; mechanism of formation; physical and chemical properties; thin layer deposits by electrodeless discharge. Electric applications discussed are high volumetric capacity microcapacitors; bistable commutation; passivation of semiconductors. ESA

N78-20349# Arizona Water Resources Research Center, Tucson.
LABORATORY AND FIELD DEVELOPMENT OF ASPHALT-RUBBER FOR USE AS A WATERPROOF MEMBRANE Final Report, Aug. 1976 - Oct. 1977
R. K. Frobel, R. A. Jimenez, and C. B. Cluff Jul. 1977 68 p refs Sponsored in part by DOT
(PB-275462/0; FHWA/AZ/RS-76-167; ADOT/RS-14(167))
Avail: NTIS HC A04/MF A01 CSCL 11J

Three rubber particle size distributions and three asphalt-rubber (A-R) spread quantities were investigated. Laboratory testing utilized for physical property determination included thin film permeability, water absorption, water vapor transmission, ductility, tensile-toughness, viscosity, and slope stability. The results of the study showed that the A-R as an integral membrane is relatively impermeable. Installation of experimental field plots provided additional positive information on the waterproofing characteristics of the A-R and also helped develop field procedures on A-R application to a prepared subgrade. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N78-20350*# Gordian Associates, Inc., New York.
COMPUTER MODEL FOR REFINERY OPERATIONS WITH EMPHASIS ON JET FUEL PRODUCTION. VOLUME 1: PROGRAM DESCRIPTION Final Report
Daniel N. Dunbar and Barry G. Tunnah 14 Feb. 1978 127 p refs
(Contract NAS3-20620)
(NASA-CR-135333; Rept-1099-1-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 21D

A FORTRAN computer program is described for predicting the flow streams and material, energy, and economic balances of a typical petroleum refinery, with particular emphasis on production of aviation turbine fuel of varying end point and hydrogen content specifications. The program has provision for shale oil and coal oil in addition to petroleum crudes. A case study feature permits dependent cases to be run for parametric or optimization studies by input of only the variables which are changed from the base case. Author

N78-20351*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER PROGRAM FOR OBTAINING THERMODYNAMIC AND TRANSPORT PROPERTIES OF AIR AND PRODUCTS OF COMBUSTION OF ASTM-A-1 FUEL AND AIR
Steven A. Hippensteele and Raymond S. Colladay Mar. 1978 56 p
(NASA-TP-1160; E-9371) Avail: NTIS HC A04/MF A01 CSCL 21B

A computer program for determining desired thermodynamic and transport property values by means of a three-dimensional (pressure, fuel-air ratio, and either enthalpy or temperature) interpolation routine was developed. The program calculates temperature (or enthalpy), molecular weight, viscosity, specific heat at constant pressure, thermal conductivity, isentropic exponent (equal to the specific heat ratio at conditions where gases do not react), Prandtl number, and entropy for air and a combustion gas mixture of ASTM-A-1 fuel and air over fuel-air ratios from zero to stoichiometric, pressures from 1 to 40 atm, and temperatures from 250 to 2800 K. Author

N78-20352# Defence Research Establishment Valcartier (Quebec).
POLYETHER AND POLYESTER BINDERS IN COMPOSITE PROPELLANTS
M. Tremblay, G. Perrault, G. Duchesne, and E. Ahad Mar. 1977 38 p refs In FRENCH; ENGLISH summary
(AD-A038801; DREV-R-4069/77) Avail: NTIS HC A03/MF A01 CSCL 21/9

A hydroxyl-terminated polybutadiene prepolymer (R45M) was crosslinked with an epoxide to yield an elastomeric material known as a polyether or with a mixture of an anhydride and an epoxide to form a polyester material. Polyether and polyester propellants containing up to 88% of solid ammonium perchlorate (AP) in the powder form and aluminum powder were prepared from the above two materials (binders). The physical and mechanical properties of these propellants depended on the ratio and on the order of addition of ingredients, the curing temperature and the presence of surface-active agents. Polyester propellants were made either by using R45M prereacted with anhydrides or by mixing simultaneously all ingredients with the solids. Polyester propellants made by the former procedure had superior properties to those made by the latter. Polyether propellants had slightly lower mechanical and physical properties than those of polyesters. The effectiveness of the several surface-active additives in these highly filled composite propellants were evaluated by mechanical spectroscopy. Some additives were found to improve the mechanical properties of polyester propellants, but were detrimental to the catalytic activity of AP in polyether propellants. Author (GRA)

N78-20353# Atlantic Research Corp., Alexandria, Va. Kinetics and Combustion Group.

AN ANALYTICAL AND EXPERIMENTAL STUDY OF THE EROSIVE BURNING OF COMPOSITE PROPELLANTS, A. MODELING OF SINGLE PARTICLE ALUMINUM COMBUSTION, B Final Report, 1 Oct. 1975 - 30 Sep. 1976

Merrill K. King Nov. 1976 142 p refs
(Contract F44620-76-C-0023; AF Proj. 2308)
(AD-A050333; TR-PL-5673; AFOSR-78-0060TR) Avail: NTIS HC A07/MF A01 CSCL 21/9

Augmentation of solid propellant burning rate often occurs in the presence of strong product gas flow across the burning surface: this phenomenon is referred to as erosive burning. Increasing use of motors with low port-to-throat area ratios (including nozzleless motors) is leading to increased occurrence and severity of erosive burning. A first generation model based upon bending of columnar diffusion flames by a crossflow, permitting prediction of the effect of high-velocity crossflow on the burning rate of a composite propellant given only the zero-crossflow burning rate characteristics, is briefly summarized and compared with data. A second generation model (still under development) which does not require even zero-crossflow burning rate data, using only composition and particle size as input, is outlined. In addition, a test device permitting extensive characterization of burning rate-pressure-crossflow velocity relationships for various propellants with direct continuous measurement of instantaneous burning rate by high-speed cinematography is described, and results of a series of tests with seven propellants are presented. A model of aluminum particle combustion in CO2 which incorporates measured kinetic data for the gas phase reaction of aluminum with CO2 rather than assuming a flame-sheet (infinite gas-phase kinetics) as in past models has been developed, programmed and used to parametrically study the effect of various parameters on particle burning rate and burn-time. This model treats aluminum oxide condensation as occurring in an infinitesimally thin shell whose location is determined by specification of a condensation temperature. GRA

N78-20354# Atlantic Research Corp., Alexandria, Va.

AN ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF THE EROSIVE BURNING OF COMPOSITE PROPELLANTS Interim Report

Merrill K. King Oct. 1977 30 p refs
(Contract F44620-76-C-0023; AF Proj. 2308)
(AD-A050386; AFOSR-78-0039TR) Avail: NTIS HC A03/MF A01 CSCL 21/9

Augmentation of solid propellant burning rate often occurs in the presence of strong product gas flow across the burning surface: This phenomenon is referred to as erosive burning. Increasing use of motors with low port-to-throat area ratios (including nozzleless motors) is leading to increased occurrence and severity of erosive burning. A first generation model based upon bending of columnar diffusion flames by a crossflow, permitting prediction of the effect of high-velocity crossflow on the burning rate of a composite propellant given only the zero-crossflow burning rate characteristics, is briefly summarized and compared with data. A second generation model (currently under development) which does not require even zero-crossflow burning rate data, using only composition and particle size as input, is outlined. In addition, a test device permitting extensive characterization of burning rate-pressure-crossflow velocity relationships for various propellants with direct continuous measurement of instantaneous burning rate by high-speed cinematography is described, and results of a series of tests with four propellants are presented. These tests indicate that the first generation composite propellant erosive burning model has reasonably good predictive capability, particularly in the higher pressure region where the propellant combustion is dominated by the propellant heterogeneity. GRA

N78-20355# Los Alamos Scientific Lab., N. Mex.

LASL METHODS FOR DERIVATION OF PREDICTIVE MODELS FOR EXPLOSIVES THERMAL HAZARDS AND LIFETIME

R. N. Rogers 1977 5 p refs Presented at the Conf. on the Standardization of Safety and Performance Tests for Energetic Mater., Dover, N.J., 21-23 Jun. 1977
(Contract W-7405-eng-36)
(LA-UR-77-1378; Conf-770635) Avail: NTIS HC A02/MF A01

Sensitivity, thermal stability, and toxicity are the three major safety factors that must be considered in selecting an explosive for any specific application. The procedures used at LASL to obtain quantitative data on the thermal stability of any new explosive system are discussed. ERA

N78-20356# Mobil Research and Development Corp., Paulsboro, N. J.

FLUID BED PROCESS STUDIES ON SELECTIVE CONVERSION OF METHANOL TO HIGH OCTANE GASOLINE Monthly Report, May 1977

Jun. 1977 22 p refs
(Contract EX-76-C-01-2490)
(FE-2490-8) Avail: NTIS HC A02/MF A01

In the fluid bed flow studies the major accomplishments were the experimental testing of different designs for feed distributor and selection of a five prong nozzle with atomizer, design of capacitance probe for high temperature operation, and testing of reactor cyclone with subsequent design improvement. In the methanol to gasoline pilot plant design and construction, the major accomplishments were the completion of the assembly of the reactor regenerator system, completion of wiring on the instrument panel, and installation of heating elements on the reactor regenerator system. Author (ERA)

N78-20357# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Trauen (West Germany). Inst. fuer Chemische Raketenantriebe un Verfahrenstechnik.

SPECTROSCOPIC INVESTIGATIONS OF SOLID ROCKET PROPELLANT COMBUSTION

R. Mestwerdt 1977 55 p refs
(DLR-IB-456-77/10) Avail: NTIS HC A04/MF A01

The composition of flames at different levels above the solid propellant surface was investigated by emission spectroscopy of specific molecules. Considerable changes of intensity were detected indicating that NH and CN molecules, as well as atomic carbon, are involved close to the surface whereas OH, potassium sodium, copper chlorides, and chromium molecules appear in every part of the flame. ESA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N78-20358# Shock and Vibration Information Center (Defense), Washington, D. C.

THE SHOCK AND VIBRATION DIGEST, VOLUME 9, NUMBER 6

Jun. 1977 93 p refs
(AD-A041051) Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375 CSCL 20K

Methods of full and partial force balancing of linkages, underwater fluid-structure interaction, and ship hull vibration are considered. A bibliography of current literature dealing with sound, shock, and vibration technology is included. For individual titles, see N78-20359 through N78-20360.

N78-20359# Gulf and Western Advanced Development and Engineering Center, Swarthmore, Pa.
BALANCING OF LINKAGES c37
R. S. Berkof, G. G. Lowen (City Coll. of The City Univ. of New York), and F. R. Tepper (Picatinny Arsenal) *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 6 Jun. 1977 p 3-10 refs (For availability see N78-20358 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375 CSCL 20K

The theory of the balancing of linkages for shaking force, shaking moment, input torque, bearing forces, or other internal loads is reviewed with emphasis on application to machines and devices in order to optimize design and improve performance. Author

N78-20360# General Dynamics Corp., Groton, Conn. Electric Boat Div.
UNDERWATER FLUID STRUCTURE INTERACTION. PART 3: ACOUSTICALLY-APPLIED FORCES c34
L. H. Chen and M. Pierucci *In* Shock and Vibration Inform. Center. The Shock and Vibration Digest, Vol. 9, No. 6 Jun. 1977 p 13-17 refs (For availability see N78-20358 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375 CSCL 20K

Underwater applications of fluid structure interaction phenomenon are considered. Sound radiation and scattering, structural vibration and shock response, flow induced noise, hydrodynamic divergence and flutter, boundary layer stability, and propeller induced forces are among the topics discussed. Author

N78-20361# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 9, NUMBER 11
Nov. 1977 73 p refs
(AD-A047848) Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

The response of a complex structure to dynamic excitation, prediction of the dynamic response or pressure vessels, piping systems, and their support and restraint structures, and fluid excitations of cylinders in cross flow are considered. A bibliography of current literature dealing with sound, shock, and vibration technology is included. For individual titles, see N78-20362 through N78-20364.

N78-20362*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
METHODS OF COMPONENT MODE SYNTHESIS c39
R. R. Craig, Jr. *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 11 Nov. 1977 p 3-10 refs (For availability see N78-20361 11-31)
(Grant NsG-1268)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

A generalized substructure coupling, or component mode synthesis, procedure is described. Specific methods, applications, and such special topics as damping and experimental verification are surveyed. Author

N78-20363# Battelle Columbus Labs., Ohio. Applied Dynamics and Acoustics Section.
DYNAMIC MODELING OF PRESSURE VESSELS AND PIPING SYSTEMS c39
R. H. Prause *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 11 Nov. 1977 p 13-19 refs (For availability see N78-20361 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

Dynamic modeling of pressure vessels and piping systems is considered in view of public safety requirements for nuclear power generating plants. Formulation of a mathematical model to predict the dynamic response of a structure is described. Linear and nonlinear systems are included. Future research topics are briefly summarized. J.M.S.

N78-20364# Argonne National Lab., Ill.
FLOW-INDUCED VIBRATIONS OF CIRCULAR CYLINDRICAL STRUCTURES. PART 2: CROSS-FLOW CONSIDERATIONS c34
S. S. Chen *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 11 Nov. 1977 p 21-27 refs (For availability see N78-20361 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

The state of the art of flow induced vibration of circular cylindrical structures is reviewed. Both parallel and cross flow problems are considered. Analytical methods, classification of structural responses, and characteristics of the vibration of cylinders in stationary fluid and parallel flow are included along with cross flow induced vibration, design, and research needs. Author

N78-20365# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 9, NUMBER 12
Dec. 1977 144 p refs Presented at the 48th Shock and Vibration Symp., Huntsville, Ala., Oct. 1977
(AD-A048062) Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

The mechanical shock environment produced by an underwater explosion, finite element analysis of mechanisms, and the response of structural elements to blast loads are among the topics considered. A bibliography of current literature dealing with sound, shock, and vibration technology is included. For individual titles, see N78-20366 through N78-20367.

N78-20366# Florida Univ., Eglin AFB. Graduate Engineering Center.
RESPONSE AND FAILURE OF SIMPLE STRUCTURAL ELEMENTS SUBJECTED TO BLAST LOADINGS c39
C. A. Ross, W. S. Strickland (Air Force Armament Lab.), and R. L. Sierakowski *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 12 Dec. 1977 p 15-26 refs (For availability see N78-20365 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

A review of experiments involving basic structural elements such as beams, plates, and cylindrical shells that have been exposed to mild blast loadings is given. The response and subsequent failure of these structural elements are described in some detail. Author

N78-20367# Digital Equipment Corp., Maynard, Mass.
THE FINITE ELEMENT APPLIED TO THE ANALYSIS OF MECHANISMS AND MACHINES c37
R. C. Winfrey *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 12 Dec. 1977 p 27-33 refs (For availability see N78-20365 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

A survey of some approaches to the analysis of mechanism is presented. Complex models are described, as are various problems associated with the use of finite elements in such analyses. Author

N78-20368*# National Aeronautics and Space Administration, Washington, D. C.
NEW TYPES OF DWELLINGS FOR PROSPECTIVE CONSTRUCTION AFTER 1981
V. Butuzov and Ye. Kapustyan Jul. 1977 12 p Transl. into ENGLISH from Arkhitektura (USSR), no. 3, 1974 p 17-30 Transl. by Sci. Transl. Serv., Santa Barbara, Calif.
(Contract NASw-2791)
(NASA-TM-75025) Avail: NTIS HC A02/MF A01 CSCL 13C

Architectural considerations for the next stage of mass housing construction in the U.S.S.R. are explored. The architects are concerned with both the aesthetic and functional quality of the constructions, in terms of the prospective inhabitants as well as the environments in which they will be located. Experimental

building designs emphasize: variety of appearance, environmental control, and the communal life. Author

N78-20369# Brookhaven National Lab., Upton, N. Y.
NITROGEN PRESSURE IN A VACUUM SYSTEM
D. Edwards, Jr. 1977 12 p Presented at the 24th Natl. Vacuum Symp., Am. Vacuum Soc., Boston, 8 Nov. 1977
(Contract EY-76-C-02-0016)
(BNL-23195; Conf-771110-3) Avail: NTIS HC A02/MF A01

Because the N2 outgassing rate from walls of a vacuum system is generally recognized to be very small, the presence of a N2 pressure in the system is a useful indication of the presence of real leaks to the atmosphere. A technique of thermal desorption mass spectrometry is introduced which allows the N2 pressure in the background gas of a baked system to be separated from a CH4 background to a minimum level of N2 detectability of approximately 1 percent of the CO background pressure. In typical baked systems (of which an example is given), it is possible to readily determine the sum of all real N2 leaks to atmosphere at a level of approximately 10 to the minus eleventh power Torr liter/s. The technique is ideally suited to large complex systems since the leak rate can be evaluated before detailed leak finding procedures are initiated. ERA

N78-20370# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
UNIFIED CONCEPTS OF CONSTITUTIVE MODELLING AND NUMERICAL SOLUTION METHODS FOR CONCRETE CREEP PROBLEMS
J. H. Argyris, K. S. Pister (Calif. Univ., Berkeley), J. Szimmat, and K. J. William 1976 73 p refs
(Grant BMFT-SBB4)
(ISD-185) Avail: NTIS HC A04/MF A01

An internal variable model was developed for concrete creep with the following features: creep strain is a linear functional of stress history; application or removal of stress produces instantaneous elastic response; upon removal of stress, creep deformations partially recover, approaching in the limit an irrecoverable part. The mechanism of each creep component is affected by temperature, humidity, and loading age. The internal state variables were derived from concrete creep data with loading ages ranging from 7 to 4560 days and temperatures from 20 to 95 C. Several aging models were examined for which the parameters were determined via least square optimization. A root mean square criterion was used to assess the approximation. A step by step algorithm was developed for incremental solution of the time-dependent creep process, noting that the governing equation of evolution lends itself to an economic computer solution without storing previous results. The one-dimensional constitutive statements were extended to multiaxial conditions and subsequently projected from the local level onto the structural level via finite elements (incremental initial load method). The creep behavior of a prestressed concrete reactor vessel was examined for a loading history which includes hygrothermal effects due to drying and heating as well as prestress and cycling pressure.
Author (ESA)

N78-20371# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
IDENTIFICATION OF CANDIDATE ZERO MAINTENANCE PAVING MATERIALS, VOLUME 1 Final Report, May 1974 - May 1977
G. C. Hoff, L. N. Godwin, K. L. Saucier, A. D. Buck, and T. B. Husbands May 1977 288 p refs Sponsored by FHWA 2 Vol.
(PB-275405/9; FHWA-RD-77-109) Avail: NTIS HC A13/MF A01 CSCL 13C

Materials such as Gussasphalt, asbestos asphalts, sulfur modified asphalts, noncalcareous inorganic cements (sulfur and phosphate), and expansive cements were reviewed. These materials were compared to conventional asphalt and portland cement concrete systems on the basis of mechanical properties, ease of construction and maintenance, environmental compatibility, availability, cost, and possible uses. Many of the materials possess characteristics which could be incorporated into pavements to greatly extend the period prior to maintenance.
Author (GRA)

N78-20372# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
IDENTIFICATION OF CANDIDATE ZERO MAINTENANCE PAVING MATERIALS, VOLUME 2 Final Report, May 1974 - May 1977
G. C. Hoff, L. N. Godwin, K. L. Saucier, A. D. Buck, and T. B. Husbands May 1977 398 p refs Sponsored by FHWA 2 Vol.
(PB-275406/7; FHWA-RD-77-10) Avail: NTIS HC A17/MF A01 CSCL 13C

These studies are concerned with fiber reinforced concrete, polymers in concretes, sealants, ceramics, prestressed concrete, and vacuum processed concrete. These materials were compared to conventional asphalt and portland cement concrete systems on the basis of mechanical properties, ease of construction and maintenance, environmental compatibility, availability, cost, and possible uses. Many of the materials possess characteristics which could be incorporated into pavements to greatly extend the period prior to maintenance. Author (GRA)

N78-20373# California Univ., Berkeley. Earthquake Engineering Research Center.
CONCRETE CONFINED BY RECTANGULAR HOOPS AND SUBJECTED TO AXIAL LOADS
Jose Vallenas, Vitelmo V. Bertero, and Egor P. Popov Aug. 1977 125 p refs
(Grants NSF AEN-73-07734-A02; NSF ENV-76-04263)
(PB-275165; UCB/EERC-77/13) Avail: NTIS HC A06/MF A01 CSCL 13C

Results of an experimental investigation carried out on the subject of concrete confined by rectangular hoops subjected to axial loads are reported. The behavior of the confined concrete was studied regarding the effect of three parameters: (1) concrete cover, (2) lateral reinforcement (confinement), and (3) longitudinal reinforcement. Fourteen prismatic specimens were tested. These were subjected to monotonically increasing axial compressive loads applied at low strain rates. The experimental results obtained were then evaluated and subsequently compared. GRA

N78-20374# Washington Univ., Seattle. Dept. of Civil Engineering.
EFFECT OF REINFORCING BAR SIZE ON SHEAR TRANSFER ACROSS A CRACK IN CONCRETE, PART 3 Final Report, 14 Oct. 1974 - 30 Sep. 1977
Alan H. Mattock Sep. 1977 156 p refs
(Grant NSF ENG-74-21131)
(PB-275259/0; SM-77-2-Pt-3) Avail: NTIS HC A08/MF A01 CSCL 13C

The shear transfer strength of reinforced concrete subject to single direction and cyclically reversing loading was studied, the latter simulating earthquake conditions. The primary topics studied were the influence of the existence in the shear plane of an interface between concretes cast at different times and the influence of reinforcing bar diameter on shear transfer across a crack in monolithic concrete. Author

N78-20375# California Univ., Richmond. Earthquake Engineering Research Center.
INELASTIC BEHAVIOR OF ECCENTRICALLY BRACED STEEL FRAMES UNDER CYCLIC LOADINGS
Charles W. Roeder and Egor P. Popov Aug. 1977 329 p refs Sponsored in part by Am. Iron and Steel Inst.
(Grant NSF ENV-76-04263)
(PB-275526/2; UCB/EERC-77/18) Avail: NTIS HC A15/MF A01 CSCL 13M

A structural system, the eccentric bracing system, which possesses many advantages in the seismic design of steel structures, is described in this work. This system employs diagonal braces with deliberately large eccentricities with respect to the beam-column joint. Linear elastic analysis indicates that the lateral stiffness remains essentially constant over a wide range of small to moderate eccentricities. Therefore, eccentrically braced frames offer the elastic strength and stiffness of a braced frame and the energy dissipation of a steel moment resisting frame. The system is very suitable for the design of earthquake resistant structures. GRA

N78-20376# National Bureau of Standards, Washington, D. C. Cryogenics Div.
CRYOGENIC FLUIDS DENSITY REFERENCE SYSTEM: PROVISIONAL ACCURACY STATEMENT
J. D. Siegwarth, B. A. Younglove, and J. F. LaBrecque Nov. 1977 31 p refs Sponsored in part by Am. Gas Assoc.
(PB-275450; NBS-TN-698) Avail: NTIS HC A03/MF A01 CSCL 14B

The density reference system of the cryogenics division of the National Bureau of Standards is described. The system was used in making density measurements of cryogenic liquids. The methods of computation and the accuracy to which the density of the liquid can be measured are discussed in detail. The estimate of sample standard deviation for a single density measurement made using the system is 0.016% (at 422.63 kg/cu m). Using three times this standard deviation as a limit for random error and using 0.028% as the bound for known sources of possible systematic error, the uncertainty of a single determination with this system is + or - 0.076%. GRA

N78-20377# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Civil Engineering.
PROBABILITY THEORY AND RELIABILITY ANALYSIS IN GEOTECHNICAL ENGINEERING
Dimitrios Athanasiou-Grivas, ed. Aug. 1977 301 p refs
(Grant NSF ENG-77-12726)
(PB-276179/9) Avail: NTIS HC A14/MF A01 CSCL 13B

The role that probability theory and reliability analysis can play in geotechnical engineering was explored. Topics considered include the following: (1) Material parameters, (2) Settlement (3) Stability, (4) Quality control, (5) Soil dynamics, and (6) Decision analysis. GRA

N78-20378# Agbabian Associates, El Segundo, Calif.
AN EVALUATION OF THE EFFECTS OF TRAVELING SEISMIC WAVES ON THE THREE-DIMENSIONAL RESPONSE OF STRUCTURES
S. D. Werner, L. C. Lee, H. L. Wong, and M. D. Trifunac Oct. 1977 161 p refs
(Grant NSF ENV-75-02473)
(PB-275869/6; AA-R-7720-4514; NSF/RA-770310) Avail: NTIS HC A08/MF A01 CSCL 13B

A methodology was developed for analyzing the fully three-dimensional dynamic response of structures that: (1) are above the ground, elastic, and have an arbitrary configuration; (2) are supported on any number of rigid foundations of arbitrary shape that rest on the surface of an elastic half-space; and (3) are subjected to input motions from body or surface waves with arbitrary excitation frequencies and angles of incidence. The analysis results clearly demonstrate the importance of traveling wave effects and the influence of different angles of incidence on the three-dimensional bridge response characteristics. GRA

N78-20379# Connecticut Dept. of Transportation, Wethersfield.
EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES
Michael M. Kasinskas Jun. 1977 31 p Sponsored in part by DoT
(PB-275822/5; FHWA/CT/RD-396-2-77-8; Rept-396-2-77-8; Rept-2) Avail: NTIS HC A03/MF A01 CSCL 13B

A new method of destroying snowpack and ice, which uses high-speed sodium chloride brine jet streams, is discussed. This report presents information and data on the construction of a prototype salt brine apparatus. The results of the field trials demonstrate that the salt brine concept does work and that substantial savings can accrue. Author

N78-20380# Massachusetts Inst. of Tech., Cambridge. Dept. of Architecture.
LIGHTWEIGHT BUILDING MATERIALS FOR THE STORAGE OF SOLAR ENERGY Technical Report, May 1975 - May 1977
Timothy E. Johnson, Sean Wellesley-Miller, and Dennis Andrejko Sep. 1977 77 p refs
(Grants NSF GI-41306; NSF AER-73-03341)
(PB-275684/9; NSF/RA-770326) Avail: NTIS HC A05/MF A01 CSCL 13C

Case studies and computer simulations indicated storing heat sensibly in concrete slabs conflicts seriously with space conditioning and architectural needs. Materials for storing heat latently in sunlit floor and ceiling polymer concrete tiles were developed. The polyester concrete tiles are charged with thin layers of phase change material that stabilize room temperatures and store large quantities of heat without using weighty materials which are expensive to support. The project is limited to concept development, feasibility studies, and experimental programs. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N78-20381 Washington Univ., Seattle.
A TRANSITIONAL WAVEGUIDE FOR COUPLING A HIGH INDEX THIN-FILM WAVEGUIDE TO A SINGLE MODE OPTICAL FIBER Ph.D. Thesis
Bhushan Lal Sopori 1977 202 p
Avail: Univ. Microfilms Order No. 7732564

Tapered velocity coupling of high index thin-film waveguide (TFWG) and a single-mode optical fiber (SMOF) was achieved by utilizing a low index transitional waveguide (TWG) formed on the same substrate as the primary TFWG and connected end-to-end with it. The advantages of this method are compared with those of pre-existing methods of SMOF-TWG coupling. A method of fabricating low-loss sodium-glass/SiO2 waveguides is described as well as the use of a hollow dialectric transitional waveguide. Dissert. Abstr.

N78-20382 State Univ. of New York, Buffalo.
APPLICATION OF WALSH FUNCTIONS TO FAST-ACQUISITION RANGING CODES Ph.D. Thesis
Stephen Charles Martin 1977 234 p
Avail: Univ. Microfilms Order No. 7732681

An approach is considered in which a single, correctly chosen Walsh Function is used as a ranging code and delay is estimated by examining all the outputs of a finite dimensional Walsh-Hadamard transform performed upon the received signal. It is shown that the unknown delay in the signal can be split into two parts, one dyadcally rational, and the other an irrational residual. These parts may be estimated separately. It is found that the requirements for the best signal structure are different for estimation of the rational and irrational parts of the delay. The actual Walsh code may be chosen between the two extreme cases by making a trade-off between the requirements for fine ranging accuracy, and ambiguity resolution. Dissert. Abstr.

N78-20383 Stanford Univ., Calif.
WHISTLER PROPAGATION IN A DISTORTED QUIETTIME MODEL MAGNETOSPHERE Ph.D. Thesis
Nathan Thomas Seely 1977 169 p
Avail: Univ. Microfilms Order No. 7802234

The time delay versus frequency of ground received whistlers provides valuable information on electron density and convection patterns throughout the magnetosphere. In the past the magnetospheric environment has most often been modeled by using a dipole magnetic field and field line plasma density models with constant ion-electron temperatures. This research compared whistler analyses based on the traditional models with analyses based on, (1) a hybrid quiettime magnetospheric magnetic field model that combines an internal field model with a model of the average quiettime contributions to the internal field of the ring, tail, and magnetopause current systems, and (2) a model of the plasma density along field lines that includes significant plasma temperature gradients. Dissert. Abstr.

N78-20384 Princeton Univ., N. J.
TOPICS IN OPTIMAL AND ROBUST DETECTION: QUANTIZATION, STOCHASTIC-SIGNAL DETECTION, AND MEMORYLESS DETECTION Ph.D. Thesis
Harold Vincent Poor 1977 188 p
Avail: Univ. Microfilms Order No. 78-01974

Addressed are several topics in signal detection theory each of which falls into one of three categories: the design of quantizers for use in decision systems; the detection of purely stochastic signals in non-Gaussian noise; and the design of memoryless detectors for use in m-dependent noise. Dissert. Abstr.

N78-20385 Washington Univ., Seattle.
A NEW APPROACH FOR EMERGENCY CONTROL IN THE INTERCONNECTED POWER SYSTEM Ph.D. Thesis
Keh-Ming Lu 1977 151 p
Avail: Univ. Microfilms Order No. 7732562

An approach for emergency control in the large interconnected power system was introduced by using a state space. The introduced state can be computed or estimated in a small scale computation at the local generating station. An extended local equilibrium state space linearly transformed from the conventional state space is given. Some characteristics of the extended local equilibrium state space were derived. Discussion of potential emergency control measures based on local equilibrium state space is given. The test systems were used for the computer simulation purpose. Some simulation results illustrated the theoretical proofs. Dissert. Abstr.

N78-20386 Stanford Univ., Calif.
NON-LINEAR GYRORESONANT INTERACTIONS OF ENERGETIC PARTICLES AND COHERENT VLF WAVES IN THE MAGNETOSPHERE Ph.D. Thesis
Umran Savas Inan 1977 199 p
Avail: Univ. Microfilms Order No. 7802176

A computer simulation study is made with special emphasis on computing the wave's effect on the particles. With this approach it is possible to obtain a full nonlinear solution of the equations of motion in an inhomogeneous medium. The nonlinear results are compared with those of the linear theory and a convenient criterion is presented for determining when a complete nonlinear solution is required. A full distribution of energetic particles by 40-50,000 test particles, distributed appropriately in phase space is represented. By computing the complete trajectories of all these particles the perturbation of the full distribution is estimated. The wave induced precipitated flux is computed and it is shown that significant particle fluxes can be precipitated into the atmosphere by waves of moderate intensity. These fluxes produce significant perturbations in the nighttime ionosphere. Both the incoming fluxes and the ionospheric perturbations appear to be measurable by presently available instruments. Dissert. Abstr.

N78-20387 Stanford Univ., Calif.
USE OF THE MINIMUM CROSSPOLARIZATION MODES THROUGH RAIN TO REDUCE THE RAIN CROSSPOLARIZATION IN COMMUNICATION SYSTEMS Ph.D. Thesis
Lin-Shan Lee 1977 248 p
Avail: Univ. Microfilms Order No. 7802191

It is shown that use of two orthogonal linear polarizations oriented at an optimal angle with respect to the conventional vertical and horizontal directions can reduce the rain crosspolarization to its minimum. This is actually the characteristic mode of the raindrop medium in which the transmitted signal will not change its polarization. Thus, no crosspolarization can result. Instead of finding the characteristic modes, this situation simply suggests the use of two crosscoupling networks introducing additional crosspolarization with controlled amplitude and phase before transmitting and after receiving to cancel out the crosspolarization by rain. The network applied before transmitting to the satellite is to compensate for the uplink rain effect, and that applied after receiving is to compensate for the downlink rain effect. Dissert. Abstr.

N78-20388 Princeton Univ., N. J.
STUDIES OF THE CUBIC SCHROEDINGER EQUATION Ph.D. Thesis
Yan-Chow Burt Ma 1977 190 p
Avail: Univ. Microfilms Order No. 78-00267

The cubic Schroedinger equation which is the most general equation describing the wave envelope propagation with weak dispersion and weak nonlinearity is discussed. Specific examples were the self-focusing (or defocusing) of optical beams, the deep water waves, and the wave propagation in plasma. Particular interest was in the counting of the number of solitons for an arbitrary initial wave envelope and in the wave energy needed to produce solitons. The analogous result for the polarized (vector) cubic Schroedinger equation was derived and it was the higher dimensional analogue of the previous result. Solitons interaction was studied including breather and simple soliton (or double zero soliton) interaction and breather and breather interaction. It turned out that simple superposition law (paired collision) still held even in these complicated interactions. The breather type soliton could therefore be regarded as two particles combined together and interacts with other particles as a combined system. Dissert. Abstr.

N78-20389*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
C-BAND RADAR CALIBRATION USING GEOS-3
W. B. Krabill and C. F. Martin (EG and G, Riverdale, Md.) Mar. 1978 68 p refs
(Contract NAS6-2639)
(NASA-TM-73275) Avail: NTIS HC A04/MF A01 CSCL 17I

The various methods of determining tracking radar measurement error parameters are described, along with the projected accuracy of results. Typical examples and results for calibration of radars tracking the GEOS-3 satellite are presented. Author

N78-20390*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ABSOLUTE FLUX DENSITY CALIBRATIONS OF RADIO SOURCES: 2.3 GHz
A. J. Freiley, P. D. Batelaan, and D. A. Bathker 1 Dec. 1977 88 p refs
(Contract NAS7-100)
(NASA-CR-156132; JPL-TM-33-806) Avail: NTIS HC A05/MF A01 CSCL 17B

A detailed description of a NASA/JPL Deep Space Network program to improve S-band gain calibrations of large aperture antennas is reported. The program is considered unique in at least three ways; first, absolute gain calibrations of high quality suppressed-sidelobe dual mode horns first provide a high accuracy foundation to the foundation to the program. Second, a very careful transfer calibration technique using an artificial far-field coherent-wave source was used to accurately obtain the gain of one large (26 m) aperture. Third, using the calibrated large aperture directly, the absolute flux density of five selected galactic and extragalactic natural radio sources was determined with an absolute accuracy better than 2 percent, now quoted at the familiar 1 sigma confidence level. The follow-on considerations to apply these results to an operational network of ground antennas are discussed. It is concluded that absolute gain accuracies within + or - 0.30 to 0.40 db are possible, depending primarily on the repeatability (scatter) in the field data from Deep Space Network user stations. Author

N78-20391*# Kansas Univ., Lawrence. Remote Sensing Lab.
USE OF A MULTI-LOOK UNFOCUSSED SAR PROCESSOR ON SPACECRAFT
Richard K. T. Fong Apr. 1976 26 p refs
(Contract NAS5-22384)
(NASA-CR-156721; RSL-TM-295-10) Avail: NTIS HC A03/MF A01 CSCL 17I

Two methods of processing signals from a multi-look unfocussed synthetic-aperture radar are considered. A saving in the processor complexity is achieved in comparison to a fully focussed SAR system at the expense of slightly greater clutter levels and poorer along-track resolution. In addition, lower power consumption enables the unfocussed processor to increase the number of looks to compensate in part for the reduced resolution. Author

N78-20392*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECTS OF QUANTIZATION ON SIGNAL PROCESSING
Harry E. Montgomery and Earl Schell Feb. 1978 25 p Submitted for publication
(NASA-TM-78092) Avail: NTIS HC A02/MF A01 CSCL 17B

Typically an analog signal from a space system is sampled, quantized by Analog-to-Digital (A/D) conversion, merged into a bit stream, communicated to a ground station, received by the

ground station, and processed by the ground station to extract useful information for dissemination to the users. The cost of each of these steps is reduced as the number of quantization steps is reduced in the A/D converter. The number of quantization steps should be as small as possible without losing the required information content. This report deals specifically with the accuracy of averages as a function of the number of quantized samples used to compute the averages with the noise on the analog signal as a parameter. For example, the success of the Visible Infrared Spin Scan Radiometer (VISSR) Atmospheric Sounder (VAS) Demonstration depends upon temporally averaging multiple samples in an effort to reduce noise to a sufficiently low level such that temperature profile sounding is made possible. A tutorial description of this process is presented. Author

N78-20393*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RF RADIATION FROM LIGHTNING
D. M. LeVine Feb. 1978 48 p refs Submitted for publication
(NASA-TM-78095) Avail: NTIS HC A03/MF A01 CSCL 20N

Radiation from lightning in the RF band from 3-300 MHz were monitored. Radiation in this frequency range is of interest as a potential vehicle for monitoring severe storms and for studying the lightning itself. Simultaneous measurements were made of RF radiation and fast and slow field changes. Continuous analogue recordings with a system having 300 kHz of bandwidth were made together with digital records of selected events (principally return strokes) at greater temporal resolution. The data reveal patterns in the RF radiation for the entire flash which are characteristic of flash type and independent of the frequency of observation. Individual events within the flash also have characteristic RF patterns. Strong radiation occurs during the first return strokes, but delayed about 20 micron sec with respect to the begining of the return stroke; whereas, RF radiation from subsequent return strokes tends to be associated with cloud processes preceding the flash with comparatively little radiation occurring during the return stroke itself. Author

N78-20394# Rockwell International Corp., Thousand Oaks, Calif.
MINIATURE ACTIVE MATRIX DISPLAY Final Technical Report, 15 Jun. - 14 Nov. 1977
R. D. Ketchpel Jan. 1978 42 p refs
(Contract DAAK70-77-C-0141)
(AD-A049353; SC5115.6FTR) Avail: NTIS HC A03/MF A01 CSCL 05/8

The objective of this program was the development of fabrication methods for an active matrix, flat panel TV display with a resolution of at least 400 elements per linear inch. The feasibility of such a high-resolution, solid-state, flat panel screen was demonstrated for the first time using thin film electroluminescence as the display media. A resolution of 500 lines per inch with an active area to total area ratio of greater than 0.7 was achieved. The demonstration display panel consisted of 100 x 100 active elements. Simulated scanning conditions for line-at-a-time addressing yielded a time average brightness of up to 7 ft-L under 1/500 duty cycle excitation. This advance indicates that high-resolution, solid-state, flat panel TV display devices are feasible. Further work is required in order to produce a full 500 x 500 pixel element display including development of line-at-a-time scanning electronics with the associated interface to the display surface. Author (GRA)

N78-20395# United Technologies Research Center, East Hartford, Conn.
HIGH FREQUENCY SIGNAL SOURCES USING SURFACE ACOUSTIC WAVE (SAW) TECHNOLOGY Final Technical Report, 8 Jun. 1976 - 8 Aug. 1977
Meyer Gilden Griffiss AFB, N. Y. RADC Nov. 1977 72 p refs
(Contract F19628-76-C-0263)
(AD-A050178; UTRC/R77-922615-4; RADC-TR-77-399) Avail: NTIS HC A04/MF A01 CSCL 09/5

Stabilized comb spectra generators using SAW Technology have been developed for operation at 333 MHz and higher frequencies. These signal sources and an additional CW source at 1984 MHz are being developed to provide precision signals for a rapid frequency hopping frequency synthesizer. The comb spectrum generator is based upon the Mode Locked SAW Oscillator (MLSO), a regenerative RF pulse oscillator. Stabilization, i.e., synchronization to a 1 MHz reference signal, is accomplished through injection locking of the MLSO at the fundamental RF frequency. The stabilization signal is provided by means of a Phase Locked Loop oscillator that is assembled from commercially available IC components. The first complete prototype consists of two four inch square circuit boards and consumes about 5 watts of power. This first prototype operating at 333 MHz generates the desired spectral lines (9 lines spaced 3 MHz apart) and the signal characteristics closely satisfies the goals of the program both for low FM noise and spurious signals. The judicious use of SAW filters was important for meeting the program goals. These SAW filters together with the IC components made possible a small compact package that can be even further reduced in size with further development. Preliminary results with the 828 MHz MLSO and the 1984 MHz CW source are also promising. Author (GRA)

N78-20396# Defence Research Establishment, Ottawa. (Ontario).
COMPUTER-CONTROLLED ANTENNA ARRAYS
Daniel Boivin Apr. 1977 54 p refs In FRENCH; ENGLISH summary
(AD-A039824; DREO-TN-77-9) Avail: NTIS HC A04/MF A01 CSCL 09/5

These antenna arrays, constructed at Defense Research Establishment Ottawa and installed in the Electronic Countermeasures simulation laboratory, allow the evaluation of the vulnerability of the military radar used in the laboratory. There are three antenna arrays, of which the principal array includes rows 1 to 6 inclusive (48 elements). Following that there is row 7 which is inserted at the center of the wall of the anechoic chamber. Finally there is row 0 positioned at the bottom of the wall of the anechoic chamber mainly to simulate ground clutter. This system of antennas can be controlled either manually or by computer. The simulations obtainable with this system greatly enhance our capabilities; such as simulating an aircraft moving horizontally and vertically, a blooming chaff cloud, ground clutter and angle deception jamming. The simplicity of design, the low cost, and the interchangeability of antennas without the necessity for readjustment contribute to the success of the antenna arrays. The microstrip antennas, which have been developed in the laboratory, are appropriate for such antenna arrays. These antennas also have been designed for transmitting at microwave frequencies. The band of operation of the system is from 8.5 to 9.5 GHz, while the variation in radiated power between elements does not exceed + or - 1.6 db and the variation in phase does not exceed + or - 9 deg. Author (GRA)

N78-20397# Army Missile Research and Development Command, Redstone Arsenal, Ala. Advanced Systems Development and Manufacturing Technology Directorate.
SUPPORT OF MX ELECTROMAGNETIC PULSE VALIDATION Interim Report
David Mathews Jun. 1977 77 p refs
(AD-A050257; DRDMI-EA-77-5) Avail: NTIS HC A05/MF A01 CSCL 09/1

This interim report outlines the technical progress to date on the Electrical Overstress Program at the US Army Missile Research and Development Command. The program is aimed at providing a better theoretical model of the physics of second breakdown in junction bipolar diodes, transistors, and integrated circuits, and applying this information in the development of nondestructive screening techniques for eliminating device types and individual samples which are especially susceptible to high power pulses. The program features a continuation of Defense Nuclear Agency funded research using special silicon on sapphire diodes in which the effects of self-heating are directly observable, computer analysis and simulation of both conventional transistor and special silicon on sapphire diode behavior, and selection and measurement of electrical parameters required for prediction of overstress susceptibility. Author (GRA)

N78-20398# Naval Training Equipment Center, Orlando, Fla.
NONPROGRAMMED MULTIPLE CHANNEL PANORAMIC CCTV SYSTEM Final Report, Jul. 1973 - Jul. 1976
John J. Kulik Sep. 1977 29 p refs
(XF55522015)

(AD-A050314; NAVTRAEQUIPC-IH-268) Avail: NTIS HC A03/MF A01 CSCL 17/2

Feasibility study of a 360 degree Nonprogrammed Multiple Channel CCTV System was made and a number of techniques useful for system development were conceived and tried. A stationary multiple channel system is shown to be feasible, under certain conditions, with insetted targets capable of translational electronic motion across the entire screen. Author (GRA)

N78-20399# Illinois Univ., Urbana-Champaign. Electromagnetics Lab.

SOURCE EXCITATION OF AN OPEN, PARALLEL-PLATE WAVEGUIDE

V. Krichevsky and R. Mittra Oct. 1977 43 p refs
(Grant AF-AFOSR-3066-76)
(AD-A050462; UIEM-77-19; UILU-ENG-77-2262; AFOSR-78-0118TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

In this work, we consider the problem of an open, finite-width, parallel-plate waveguide which is excited by a y-directed current source. The source current is assumed to be confined at x = xo, have a sin (N x pi/2H) or cos (N x pi/2H) variation in the y-direction, and an exp (i x Beta x Z) behavior along the longitudinal z-direction. Such an excitation can be interpreted as one spectral component of a transversely confined source. The solution to the longitudinally confined source problem can be subsequently constructed by an appropriate superposition of the spectral solutions derived in this paper. The important question of the excitation or non-excitation of the zero-mode in the guide is examined and the resonance condition for a leaky mode in an open, finite-width waveguide is derived. GRA

N78-20400# Naval Research Lab., Washington, D. C.

A METHOD FOR AUTOMATIC TEST AND EVALUATION OF MICROWAVE TRANSCEIVERS AT L-BAND FREQUENCIES Interim Report

Louis J. Lavedan, Michael Laing, and Boris Sheleg Nov. 1977 80 p refs
(AD-A050442; AD-E000084; NRL-MR-3662) Avail: NTIS HC A05/MF A01 CSCL 17/9

Complexity of modern phased array radars requires that new high speed methods of microwave component test and evaluation be devised such that, not only is the specific device under test evaluated as to quality and accuracy, but also in terms of system errors, the total of all devices is evaluated in an appropriate statistical method to assure final use compatibility. This report summarizes the effort at Naval Research Laboratory, Washington, D. C. To devise such a computer controlled laboratory test and evaluation facility capable of measuring not only CW devices, such as receivers, but also pulse devices such as transmitters. More specifically, the program as devised to implement an all solid state L-band transceiver module evaluation is described. Samples of computer programs and special test equipment schematics are included along with samples of data printout. Author (GRA)

N78-20401# Southwest Research Inst., San Antonio, Tex.

RF CANCELLATION CIRCUIT FOR SHORE-BASED VHF FM TRANSCEIVER Final Report

W. G. Guion and T. A. Millington 13 Jan. 1978 66 p
(Contract DOT-CG-73125-A)
(AD-A049683) Avail: NTIS HC A04/MF A01 CSCL 17/2

The purpose of this research and development program was to develop an optimized method of removing unwanted transmitted signals from the receiver path in a typical Coast Guard VHF FM transceiver station. The circuit developed allows continuous monitoring of the guard channel (Ch. 16, 156.8 MHz) with minimum background interference levels while transmissions are occurring from the same antenna on adjacent channels spaced as close as 150 kHz. The six-month program was divided into four phases: (1) Components and Circuit Technique Identification and Analysis; (2) Performance Evaluation of Candidate Components and Circuit Techniques; (3) System Field Tests; and (4) Specification and Documentation of Program Results. GRA

N78-20402# Ohio State Univ., Columbus. Electroscience Lab.

ELECTROMAGNETIC MODELING OF COMPOSITE WIRE AND SURFACE GEOMETRIES

E. H. Newman and D. M. Pozar Sep. 1977 23 p refs
(Grant DAAG29-76-G-0331)
(AD-A049664; ESL-4569-3; ARO-14012.1-EL) Avail: NTIS HC A02/MF A01 CSCL 20/14

A moment method solution to the problem of radiation or scattering from geometries consisting of open or closed surfaces, wires, and wire/surface junctions is presented. The method is based on the sinusoidal reaction formulation. Several examples of input impedance calculations illustrate the versatility, accuracy, and computational efficiency of the method. Author (GRA)

N78-20403# Ohio State Univ., Columbus. Electroscience Lab.

THE EFFECTS OF THE HUMAN BODY ON THE PATTERNS OF THE MANPACK TRANSCEIVER ANTENNA M.S. Thesis

Peter Mangiacotti and Edward H. Newman Jun. 1977 24 p refs
(Contract DAAG29-76-G-0067)
(AD-A049665; E5L-4311-4; ARO-13331.4-EL) Avail: NTIS HC A02/MF A01 CSCL 09/1

The effects of the human body on the radiation characteristics of the portable manpack transceiver antenna are examined in this report. These effects are demonstrated using numerical techniques employing the method of moments. The human body is modeled as a lossy dielectric and the antenna as a thin-wire radiator. Results presented show the effects of the head, arms, legs, and torso on the far-zone radiation patterns. Author (GRA)

N78-20404# Brown Univ., Providence, R. I. Div. of Engineering.

SIGNAL ESTIMATION AND SYSTEM IDENTIFICATION WITH LIMITED TIME DATA Interim Report

A. E. Pearson Dec. 1977 30 p refs
(Grants AF-AFOSR-2793-75; NSF ENG-76-15000; AF Proj. 2304)
(AD-A049498; AFOSR-78-0006TR) Avail: NTIS HC A03/MF A01 CSCL 20/1

With disturbances modeled by arbitrary solutions to a linear homogeneous differential equation, a deterministic theory is developed for parameter estimation using data over a limited time interval which has applications to signal estimation and system identification. Linear and certain classes of nonlinear and time varying systems can be treated for identification purposes. The approach circumvents the need to estimate unknown initial conditions through the use of a certain projection operator. Author (GRA)

N78-20405# Syracuse Univ., N. Y. Dept. of Electrical and Computer Science.

SPATIAL BEHAVIOR OF WIDEBAND EMITTERS Progress Report, Feb - Sep. 1977

David K. Cheng and Fung-I Tseng Dec. 1977 28 p refs
(Contract F30602-75-C-0121)
(AD-A050207; RADC-TR-77-400) Avail: NTIS HC A03/MF A01 CSCL 17/9

Typical transient responses to a linear FM signal and bandlimited white noise for a Chebyshev array equipped with a matched filter are presented. An expression for the expected power received by an array for bandlimited white noise is derived and used to obtain the average power patterns. Methods for placing and steering one or more nulls in a wideband jamming environment are studied. Author (GRA)

N78-20406# Naval Postgraduate School, Monterey, Calif.

ASAP ANTENNAS-SCATTERERS ANALYSIS PROGRAM: A USER-ORIENTED THIN-WIRE ANTENNA COMPUTER CODE

Richard W. Adler Aug. 1977 133 p refs Revised
(AD-A050015; NPS-62AB770801) Avail: NTIS HC A07/MF A01 CSCL 09/1

Previous thin-wire antenna programs have either been very specialized or all-encompassing. A beginning or occasional user does not need expertise in programming to gain insight into wire antenna structures, using this general purpose user-oriented code. The revisions contained herein correct deficiencies of handling the image problem in the original code and improve

the accuracy of calculations of structures over finite ground.
Author (GRA)

N78-20407# Naval Postgraduate School, Monterey, Calif.
TESSAC ELECTROMAGNETIC COMPATIBILITY SURVEY
Richard W. Adler Sep. 1977 161 p refs
(AD-A050016; NPS-62AB770901) Avail: NTIS HC A08/MF A01 CSCL 20/14

This report provides a summary of the state of technology, the Navy's technical capabilities and the adequacy of specifications and standards relative to electromagnetic compatibility in aircraft and ship platforms. Recommendations for improvement are made. Author (GRA)

N78-20408# Weapons Research Establishment, Salisbury (Australia).
THE NOISE REJECTION, TRACKING LAGS, AND TRANSIENT DECAY FOR EXPONENTIAL TRACKING FILTERS OF ORDER, ONE, TWO, AND THREE
J. Hayward Sep. 1977 36 p refs
(AD-A049210; WRE-TR-1854(W)) Avail: NTIS HC A03/MF A01 CSCL 17/9

Basic equations are derived for the third order, sampled data, exponential tracking filter. Lags, transient decay, and noise rejection are calculated for critical and optimal damping. Graphs and tables are provided for design purposes. The third order continuous data (analogue) tracking filter is also analyzed, and equivalence relations are derived. Author (GRA)

N78-20409# Communications Research Centre, Ottawa (Ontario). Radio and Radar Branch.
ON THE RESOLVABILITY OF SINUSOIDS OF NEARLY EQUAL FREQUENCY
R. V. Webber Dec. 1976 34 p refs
(AD-A036673; CRC-1297; DRB-TELS-41) Avail: NTIS HC A03/MF A01 CSCL 09/4

This report deals with the resolution of two sinusoids of nearly equal frequency: that is, the decision as to whether there are two sinusoids in a signal or only one and the determination of the properties of each signal. The bulk of the report is devoted to studying the difficulties with which any decision rule must deal. A possible decision rule is given at the end. GRA

N78-20410# Naval Research Lab., Washington, D. C. Telecommunication Systems Technology Branch.
ELF NONLINEAR NOISE PROCESSING EXPERIMENTAL MEASUREMENTS. PART 3: SYNOPTIC SAMPLE OF DIURNAL AND SEASONAL NOISE VARIATION IN ITALY Interim Report
Joseph Goldstein, William D. Meyers, and John R. Davis Jul. 1977 33 p refs
(AD-A047616; NRL-MR-3543-Pt-3) Avail: NTIS HC A03/MF A01 CSCL 17/2

Using a suitable nonlinearity in the input stage of an extremely low frequency receiver can improve received signal-to-noise ratio (SNR) by whitening the nongaussian atmospheric noise at these frequencies. Previous studies indicate that performance of simple clippers, carefully adjusted on the basis of the raw noise amplitude statistics, is very nearly equal to that of the optimum clipper. A collection of ELF noise data for the summer, fall and spring seasons and nearly all times of day has been acquired at a reviving site near Pisa, Italy. These data have been used to evaluate the improvement in SNR that can be expected from simple clipping under a variety of noise and propagation conditions. Under both quiet and noisy conditions little performance difference is observed among processing channels with clipping levels as far apart as 6 to 18 db, in the vicinity of the optimum clipping level. The nonlinear processing method described in this report provides at least 6 db of SNR improvement over the performance obtained without suitable processing. Author (GRA)

N78-20411# Bundesministerium der Verteidigung, Bonn (West Germany).
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS ON LABORATORY MODELS OF PHASED ARRAY ANTENNAS [EXPERIMENTELLE UND THEORETISCHE UNTERSUCHUNGEN AN LABORMODELLEN VON PHASED ARRAY ANTENNEN]
H. Lueg 1977 79 p refs In GERMAN; ENGLISH summary Succeeds BMVg-FBWT-75-4; see 76N16341
(BMVg-FBWT-77-5) Avail: NTIS HC A05/MF A01; DOKZENTBw DM 30.

Investigations on planar arrays of waveguide-fed aperture antennas scanned in the X-band are reported. A complete planar array of 18x18 antennas was constructed, of which 8x8 elements in the middle were fed and phased-controlled. Its scanning ability was verified theoretically and experimentally. Matching and decoupling of antenna arrays and broadening of the element-gain function were investigated. An active phased array with nine oscillator-modules inserted into the paths of a linear array was built up. The measured far field patterns were compared with results of a theoretical analysis. It is shown that mutual coupling of the oscillators can influence the far field characteristics of the antenna in an unfavorable manner. A method to compensate rising phase errors due to parameter drifting is introduced. It is shown, that the module can be used as a part of the phase shifting equipment. Author (ESA)

N78-20412# Elliott-Automation Space and Advanced Military Systems Ltd., Camberley (England).
ELECTROMAGNETIC COMPATIBILITY OF AN AVIONIC SUB-SYSTEM
R. B. Rowley, J. C. Kleine (ESG), and R. H. Smith 1977 6 p Presented at the 2d Symp. on Electromagnetic Compatibility, Montreaux, Switz., Jun. 1977
Avail: NTIS HC A02/MF A01

The operation of an international EMC control group is discussed for the avionics subsystem of the Panavia Tornado aircraft. The constitution of the team is outlined, and methods of control and cooperation are discussed. Specific EMC features, tests, and problems encountered are described together with an overall assessment of the net results. ESA

N78-20413 This accession not used.

N78-20414# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
SIGNAL PROCESSING IN A HIGH RESOLUTION RADAR [ZUR SIGNALVERARBEITUNG IN EINEM HOCHAUFLOESENDEN RADAR]
K. Kruecker and D. Perkuhn May 1977 48 p refs In GERMAN; ENGLISH summary
(Contract T-RF32-RF320-51099)
(Rept-2-77) Avail: NTIS HC A03/MF A01

Theory and signal processing of a high resolution radar with

a time-bandwidth-product of about 1 million are presented. Limits of range-resolution of two scatterers with unknown distance are described by means of a statistical theory of resolution. The corresponding resolution-filter results in the conventional matched filter for the limiting case of a delta impulse autocorrelation function of the radar signal. As an approximation of the theoretically desirable waveform, a periodic pseudo-random noise code as modulating signal is used in a practical high resolution radar with binary phase-shift keying. Target movement during the dwell time is taken into account by matching the range-gate control to an estimate of the Doppler of the target. An experimental radar with 15 cm resolution for satellite reconnaissance is described. Author (ESA)

N78-20415# European Space Research and Technology Center, Noordwijk (Netherlands).
PAYLOAD SIGNAL CONDITIONING AND PROCESSING
Paris ESA Aug. 1977 81 p refs Revised
Avail: NTIS HC A05/MF A01

A technological dossier is presented indicating the technical objectives to be fulfilled in regard to data acquisition and signal processing operations. The state-of-the-art is reviewed for algorithms, methods, processing technology, processing systems, applications, and the NASA/JPL program. Proposed areas of research for ESA are outlined together with industrial objectives. A survey of the potential market is presented; coordination with national activities is performed in the light of industrial policy considerations. ESA

N78-20416# Eurospace, Paris (France).
NEW TELEVISION SERVICES FORESEEN IN EUROPE IN THE ERA OF THE DIRECT TELEVISION SATELLITE, VOLUME 1 [LES SERVICES NOUVEAUX DE TELEVISION ENVISAGEABLES EN EUROPE A L'AGE DU SATELLITE DE TELEVISION DIRECTE]
ESA 1977 190 p refs In FRENCH 2 Vol.
(Contract ESA-2986/76)
(ESA-CR(P)-1019-Vol-1) Avail: NTIS HC A09/MF A01

Perspectives offered by direct satellite television in European countries were analyzed. Technical possibilities of these satellites are summarized and the legal situation resulting from the 1977 Geneva conference is presented. Recently developed new techniques are described with regard to the use of television receivers and possibilities of offering services supplementing traditional television. The economical, social, cultural, and legal context of the perspectives for direct satellite television in European countries is discussed. Possible utilization of direct satellite television for television program broadcasting is surveyed, and some sample nonconventional projects for the next decade are reviewed. ESA

N78-20417# Eurospace, Paris (France).
NEW TELEVISION SERVICES FORESEEN IN EUROPE IN THE ERA OF THE DIRECT TELEVISION SATELLITE. VOLUME 2: ANNEXES [LES SERVICES NOUVEAUX DE TELEVISION ENVISAGEABLES EN EUROPE A L'AGE DU SATELLITE DE TELEVISION DIRECTE. ANNEXES]
ESA 1977 157 p In FRENCH 2 Vol.
(Contract ESA-2986/76)
(ESA-CR(P)-1019-Vol-2) Avail: NTIS HC A08/MF A01

Perspectives offered by direct satellite television in European countries were analyzed. Detailed surveys are presented on the television situation in the main western European countries, on experiences with nonconventional television techniques or satellite television outside Europe, and on sociographical target groups in Europe. ESA

N78-20418# Institute for Telecommunication Sciences, Boulder, Colo.
ELECTROMAGNETIC COSITE ANALYSIS (EMCAN) MODEL. PART 1: THE FEASIBILITY STUDY
William A. Kissick and Garth H. Stonehocker Oct. 1977 77 p refs
(Contract DAEA18-76-F-D480)
(PB-275086; OTR-77-130-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 20N

The electromagnetic cosite analysis model (EMCAN), when implemented as a computer program, represents a prediction of the interference found in a relatively dense electromagnetic environment. The interference effects include: transmitter spurious and harmonic emissions, transmitter and receiver intermodulation, and receiver spurious responses and adjacent channel effects. The basic data inputs to the program will be the environment and the equipment files. These files come from, respectively, the consolidated frequency environment file and the cosite equipment characteristics file. The frequency range is 30 MHz to 1 GHz with a maximum separation of 5 miles (approximately 8 kilometers). GRA

N78-20419# Institute for Telecommunication Sciences, Boulder, Colo.
RADIO CHANNEL CAPACITY LIMITATIONS
R. F. Linfield Nov. 1977 92 p refs
(DOD MIPR FY7620-77-00078)
(PB-275239/2; OTR-77-132) Avail: NTIS HC A05/MF A01 CSCL 17B

The amount of information that can be transferred over any communications link in a unit of time depends upon a number of factors--both technological and physical. This report discusses these factors with emphasis on the fundamental physical limitations of radio channels. The maximum rate of information transfer over a number of radio communication links is derived and compared with an idealized system. The results obtained show that at certain signaling rates, dispersion in the channel, caused by multipath, limits the number of permissible signaling characteristics that can be changed. GRA

N78-20420# Institute for Telecommunication Sciences, Boulder, Colo.
OPERATIONAL AND COST CONSIDERATIONS IN THE USE OF OPTICAL WAVEGUIDES IN A LOCAL INFORMATION TRANSFER SYSTEM Final Report
R. L. Gallawa and W. J. Hartman Nov. 1977 82 p refs Sponsored in part by Army Communications Command, Fort Huachuca, Ariz.
(PB-275291/3; OTR-77-133) Avail: NTIS HC A05/MF A01 CSCL 17B

Attention is given to the potential use of optical waveguides in an information exchange system consisting of many terminals distributed uniformly over a circle of radius R. Cost comparison was given between coaxial cable and glass fiber systems, based on a described model. The results show that the wide bandwidth capability of fibers leads to definite cost advantages as data rates increase. The model concentrates on the star and the loop distribution systems. Various ways of coupling energy into and out of the fibers was discussed. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N78-20421 Pennsylvania Univ., Philadelphia.
AUTOMATED TEST DESIGN Ph.D. Thesis
Cihan Tinaztepe 1977 337 p
Avail: Univ. Microfilms Order No. 7730263

A methodology for designing tests to diagnose and isolate failures in analog circuits has been developed and implemented as a computer program. The input to the program consists of a circuit description and a list of possible failures as changes to the nominal unit under test. Only the circuit description is the required input. All other inputs are optional which can be specified when the user wishes to have more control of the test design. The system automatically generates a number of test strategies based on the resistance, voltage, and current measurements. Other user defined test strategies utilizing the steady-state, frequency and time domain responses of the circuit can be incorporated into the test design as well. Dissert. Abstr.

N78-20422 Washington State Univ., Pullman.
DEVELOPMENT, TESTING AND EVALUATION OF ALGORITHMS FOR THE PROTECTION OF ELECTRIC POWER SYSTEMS USING DIGITAL COMPUTERS Ph.D. Thesis
Edmund Oscar Schweitzer 1977 293 p
Avail: Univ. Microfilms Order No. 78-00320

A research project was undertaken to develop computationally efficient algorithms for transmission line and power transformer protection. Several suitable algorithms were developed, then tested by computer simulation. These tests provided sufficient justification to design and construct hardware for implementing and testing the algorithms. The hardware test system was designed around a microcomputer. An important part of the test system is the data acquisition system, which interfaces the analog time-continuous domain of the input quantities to the digital time-discrete domain of the computer. The system performed as either a directional distance relay or a transformer differential overcurrent relay with harmonic restraint. Both relays were tested using data provided by hardware models of a transmission line and a transformer. Both relays displayed excellent performance.
Dissert. Abstr.

N78-20423 Northeastern Univ., Boston, Mass.
COMPARISON OF DIFFUSED AND ION IMPLANTED P-N JUNCTIONS IN RADIATION ENVIRONMENTS Ph.D. Thesis
Walter Milo Shedd 1977 146 p
Avail: Univ. Microfilms Order No. 78-00296

A special test structure was designed and fabricated so that the only difference between the junctions was the ion implantation or diffusion processing step, thus allowing a direct comparison between the two processes. Detailed electrical evaluations of the test structure were performed before and after exposure to three types of nuclear radiation environment; high energy neutrons, Co60 gamma rays, and pulsed electron beams. Electrical measurements were made to detect differences in minority carrier lifetime, trapped oxide-charge, surface recombination and radiation induced photocurrent generation. Existing concepts of radiation damage in semiconductors are used to explain the observed variations in electrical parameters. Where the existing models proved inadequate, a new model is proposed, to explain the behavior of the gated diode test structure under neutron radiation.
Dissert. Abstr.

N78-20424 George Washington Univ., Washington, D. C.
SYNTHESIS OF RATIONAL TRANSFER FUNCTIONS USING ACTIVE DISTRIBUTED RC NETWORKS Ph.D. Thesis
John M. Saunders 1977 96 p
Avail: Univ. Microfilms Order No. 7723662

Network synthesis using distributed RC elements has not achieved the success of lumped element RC network synthesis. The fundamental reason for this lack of acceptance is the fact that distributed elements have transfer functions that are irrational functions of s, the Laplace transform variable, while design equations use rational transfer functions. This paper presents a practical synthesis procedure that, using a single Heizer network, can realize any arbitrary first or second order voltage transfer function. Examples of second order low pass, band pass, high pass, and double integrator filters are discussed. Also, experimental results of a second order high pass Butterworth filter verify the procedure.
Dissert. Abstr.

N78-20425 Stanford Univ., Calif.
MULTIVARIABLE AND MULTIDIMENSIONAL SYSTEMS: ANALYSIS AND DESIGN Ph.D. Thesis
Sun-Yuan Kung 1977 186 p
Avail: Univ. Microfilms Order No. 78-02188

Algorithms for determining the greatest common divisor (GCD) of polynomial matrices as well as solving minimal design and partial realization problems are given. Some existing one dimensional results, such as GCD extractions, coprimeness tests, and matrix fraction descriptions to the two dimension case are extended. Some results that appear to be unique to multidimensional systems such as the existence and uniqueness of primitive factorizations and the general factorizations of two dimensional polynomial matrices are discussed. Several results on two dimensional state-space representation, including comparisons of various existing models methods for circuit realizations using a minimal number of dynamic elements, and a new technique for two dimensional digital filter hardware implementations are also presented.
Dissert. Abstr.

N78-20426+ Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.
STABILITY CONDITIONS AND EROSIVE ACTION OF ARCS AT INSULATOR SURFACE [CONDITIONS DE STABILITE ET ACTION EROSIVE DES ARCS A LA SURFACE D'ISOLANTS]
A. M. Rahal and R. Mailfert (Compagn. Gen. d'Elec., Marcoussis, France) 1976 30 p refs In FRENCH Presented at Natl. Plasma Phys. Congr., Paris, 6-10 Dec. 1976
Avail: NTIS HC A03

The flashover voltage of an insulator depends on the state of the insulator surface. The conducting layer which can cover the insulator (humidity, dust) provokes and generates surface discharges. Two processes can occur: either an instable process with development of an arc leading to flashover, or slow process with small arcs propagating at the insulator surface and provoking an erosion when the surface material is a polymer. The comparison between theoretical and experimental data evidences measured flashover voltage twice as high as calculated values. An experimental device localizing small arcs on a determined zone of an insulator was developed and applied to the study of cylindrical bar synthetic resin insulators subjected to a known electric field. The contamination is obtained by salted water pulverization. The influence of parameters such as resin nature, additive nature, nature, form and granolometry of loads, on the erosion due to the surface arcs was evidenced.
ESA

N78-20427*# Sperry Flight Systems, Phoenix, Ariz.
MULTIPLEXER/DEMULTIPLEXER FLEXIBILITY ENHANCEMENT PROGRAM Final Report
27 Feb. 1978 186 p
(Contract NAS9-15359)
(NASA-CR-151659; PUB-71-1213-00-00) Avail: NTIS HC A09/MF A01 CSCL 09C

This final report summarizes the accomplishments of the NASA/JSC MDM Flexibility Enhancement Program, Contract NAS9-15359 as carried out by Sperry Flight Systems from April through December 1977. Included are discussions of major statement of work tasks and the results, conclusions and recommended actions. All tasks called out in the amended SOW were carried out. Significant development tasks which were completed included the following: (1) Development, breadboard and test of a Pulse Output 28-volt Module. (2) Development and test of a 32-channel DC Analog Input (DCIN) Differential Module. (3) Development and test of a sequence memory module using an M2708 EPROM which can be programmed in the unit. (4) Development and test of a radiator top cover for a radiation-cooled Flexible MDM.
Author

N78-20428# Microwave Associates, Inc., Burlington, Mass.
MM AND T PROGRAM FOR THE ESTABLISHMENT OF PRODUCTION TECHNIQUES FOR HIGH POWER BULK SEMICONDUCTOR LIMITERS Quarterly Report, 23 Mar. - 22 Jun. 1977
Yoginder Anand and Richard Bilotta Jul. 1977 51 p refs
(Contract DAAB07-76-C-0039)
(AD-A049088; ECOM-0039-4; QR-4) Avail: NTIS HC A04/MF A01 CSCL 09/5

X-band bulk limiters of 5 mils in thickness were fabricated using high resistivity silicon of p-type uncompensated orientation Hughes material. These bulk limiters exhibit 3 db bandwidth of 1.05 GHz and power handling capability of 10 to 15 kW at recovery time of 3 to 5 microsec. During the fabrication phase, it was further found that Hughes material etches rougher, suggesting higher dislocation density. RF testing of bulk limiters at 1 and 3 microsecond pulse widths showed that pulse energy determines the heating and recovery time. A new microwave circuit was studied to improve the low-level RF performance of the bulk limiter and diode clean-up limiter.
Author

N78-20429# Canadian Commercial Corp., Ottawa (Ontario).
MANUFACTURING METHODS AND TECHNIQUES FOR MINIATURE HIGH VOLTAGE HYBRID MULTIPLIER MODULES Quarterly Progress Report, 1 Apr. - 30 Jun. 1977

Michael Korwin-Pawlowski 21 Sep. 1977 53 p Prepared by Erie Technological Products of Canada Ltd., Trenton (Ontario) (Contract DAAB07-76-C-0041)
(AD-A046922; QPR-4) Avail: NTIS HC A04/MF A01 CSCL 09/5

The design of the curved and rectangular capacitor banks was finalized, the coating techniques developed and the choice of the lead material and attachment technique made. Rectangular and curved multipliers were fabricated for the First Engineering Sample. Author (GRA)

N78-20430# Weapons Research Establishment, Salisbury (Australia).
PROCEEDINGS OF SYMPOSIUM SIGNAL PROCESSING FOR ARRAYS
H. A. DAssumpcao May 1977 204 p refs
(AD-A047017; WRE-MISC-1) Avail: NTIS HC A10/MF A01 CSCL 12/1

Arrays of receivers are used in many fields of science and engineering - e.g., radio astronomy, seismology, underwater acoustics, radar and medical ultrasonics. Although there are great differences in the hardware for processing the signals received by such arrays, the underlying principles are generally similar. Recognizing that there are a number of people working with various types of arrays in Australia, a two-day symposium at the Weapons Research Establishment, Salisbury, South Australia, was sponsored by the Defence Science and Technology Organization of the Australian Department of Defence. There were about 100 attendees, including several from overseas.GRA

N78-20431# Weapons Research Establishment, Salisbury (Australia).
LIGHTNING PROTECTION FOR WRE COMPUTER CABLE NETWORK
A. K. Smithson May 1977 15 p refs
(AD-A047080; WRE-TM-1796(E)) Avail: NTIS HC A02/MF A01 CSCL 09/1

Following a violent thunderstorm, widespread damage occurred to terminal equipment connected via an underground cable distribution system to the W.R.E. Computer. This memo summarizes the results of investigations undertaken into available equipment and techniques which can be utilized to prevent similar damage in future thunderstorms. Author (GRA)

N78-20432# Queensland Univ., Brisbane (Australia). Dept. of Electrical Engineering.
PRINCIPLES OF PROTECTION OF GROUND BASED RADIO STATIONS AND OTHER INSTALLATIONS FROM DAMAGE BY LIGHTNING
Jun. 1977 85 p refs
(AD-A048178; EE77/5; TN-2/77) Avail: NTIS HC A05/MF A01 CSCL 17/2

The primary purpose of this manual is to supply recommendations for the protection of vulnerable equipment in Naval H.F. radio stations from the damaging effects of lightning strikes in areas of relatively high lightning incidence. The recommendations, which can be applied to any installation containing electronic equipment operating in a high lightning-incidence area, include methods of interception of direct strokes, protection against induced current and voltage surges, and protection against ground currents due to lightning. The expected number of lightning strikes per year to an installation may be based on the thunderday level for the region. This information may be combined with the statistical distributions of peak current in lightning flashes to predict the frequency of occurrence of injected currents of various magnitudes. Adequate earthing arrangements, depending on the local soil resistivity, will prevent excessive potentials within or between various parts of an installation. With suitably placed grounded overhead shield wires, it should be possible to prevent too direct strikes to any vulnerable part of an installation excepting antennas. GRA

N78-20433# Air Force Weapons Lab., Kirtland AFB, N. Mex.
THERMAL NEUTRON DAMAGE IN BIPOLAR TRANSISTORS Final Report
T. D. Stanley Dec. 1977 77 p refs
(AD-A049626; AFWL-TR-77-168) Avail: NTIS HC A05/MF A01 CSCL 09/1

An experimental test was made of the hypothesis that the source of thermal neutron damage in bipolar PNP transistors is the result of thermal neutron captures by the Boron-10 present in the emitter region of the transistors. Transistors were specifically made using three different ratios of Boron-10 to Boron-11 as the emitter dopant material, and in four different geometries. Forty-two of these specially made transistors were exposed to thermal neutron fluences as high as approximately 5 x 10 to the 15th neutrons per square centimeter. In each case the damage observed corresponded to the fraction of Boron-10 to total boron used as the emitter dopant material, thus confirming the hypothesized damage mechanism. The dependence of the collector current, thermal neutron fluence, and emitter-base geometry on the observed gain degradation also indicated that bulk damage is responsible for thermal neutron damage in PNP transistors. Some devices were also irradiated in a fast-neutron environment. Fast neutrons were found to be approximately 100 times more effective than thermal neutrons in producing damage in the devices that use a naturally occurring ratio of Boron-10 to Boron-11 in the emitter. GRA

N78-20434# Shaker Research Corp., Ballston Lake, N. Y.
ELECTRIC MOTOR RELIABILITY MODEL Final Technical Report, Sep. 1976 - Sep. 1977
D. S. Wilson and R. Smith Dec. 1977 116 p refs
(Contract F30602-76-C-0413)
(AD-A050179; RADC-TR-77-408) Avail: NTIS HC A06/MF A01 CSCL 09/3

An existing data failure bank consisting of over 2000 actual fractional horsepower (FHP) motor failures was upgraded and utilized to develop a failure model for FHP motors. Motor failures were dominated by two failure modes; i.e., winding failures and bearing failures. A mathematical reliability model was developed for each failure mode utilizing a Weibull cumulative distribution function and regression technique. Results of a literature survey of both failure modes were used to supplement failure data where required and verify the developed models. Failure modes were recombined into a competing risk cumulative distribution model for use in predicting overall motor life and failure rates. Author (GRA)

N78-20435# Texas Instruments, Inc., Dallas. Central Research Labs.
X-BAND SOLID STATE MODULE Semiannual Technical Report, 1 Apr. - 30 Sep. 1977
W. R. Wisseman, F. H. Doerbeck, R. E. Lehmann, H. M. Macksey, and V. Sokolov Nov. 1977 67 p refs
(Contract N00173-76-C-0384)
(AD-A050195; TI-08-77-48) Avail: NTIS HC A04/MF A01 CSCL 17/9

This interim report covers the second six months of an eighteen-month program to develop an X-band solid state amplifier. The amplifier is the critical component of an all solid state transceiver module for use in active element, airborne, phased array radars. The performance goals are an output power of 5 W with 25 db gain over the 9 to 10 GHz frequency band with an efficiency greater than or equal to 20% under pulsed conditions. Two approaches are being pursued to meet these goals: an all GaAs FET amplifier and an FET/Read diode hybrid amplifier. At the completion of the program, two amplifiers of each type will be delivered. The effort during this period included continuation of GaAs FET development with emphasis on obtaining devices suitable for the power amplifier stage. The three-stage driver amplifier development was completed. An output power of 1.6 W with 20 db gain and 26% efficiency over the 9 to 10 GHz frequency band was achieved, meeting the design goals. Extensive pulse measurements have been made on several FET amplifiers, and the results indicate that there are no significant limitations to the use of these amplifiers in active-element, phase array radar systems. Author (GRA)

N78-20436# Naval Avionics Facility, Indianapolis, Ind.
FLUID RESISTANCE TESTING OF ELECTRICAL WIRE USED IN AIRCRAFT AND MISSILES, PART 4
Willard D. Watkins 19 Oct. 1977 31 p refs
(AD-A047573; NAFI-TR-2210-Pt-4) Avail: NTIS HC A03/MF A01 CSCL 09/1

Several types of insulated electrical wire purchased to MIL-W-81044 were immersed in cleaners purchased to MIL-C-43616. The ability of the insulation to withstand degradation by the cleaners was determined by subjecting the conditioned wire to a dielectric withstand voltage test. The electrical insulation dc resistance was also determined. Author (GRA)

N78-20437# Naval Ocean Systems Center, San Diego, Calif.
ADAPTIVE NOISE CANCELLING AND ENHANCEMENT OF A SINUSOID IN UNCORRELATED NOISE Research and Development Report, Aug. - Nov. 1977
E. H. Satorius 1 Dec. 1977 53 p refs
(AD-A050313; NOSC/TR-184) Avail: NTIS HC A04/MF A01 CSCL 09/3

The response of the adaptive line canceller and enhancer (ALICE) processor to inputs which contain sinusoidal interferences in uncorrelated noise is examined. It is found that under certain conditions the steady-state output power spectrum of ALICE will contain peaks at the frequencies of the interfering sinusoids. In general, the growth time of these peaks is much longer than the ALICE's response time to a signal. However, once the peaks appear at the interference frequencies, their presence may interfere with the detection of other signal peaks in the output power spectrum. Therefore, different methods of eliminating these peaks are examined: increasing the ALE delay, increasing the ANC notch widths, and adding uncorrelated noise to the ALE input. Experimental data that indicate the validity of these analyses are included. GRA

N78-20438# ITT Electron Tube Div., Easton, Pa.
LONG LIFE X-RAY TUBES FOR AN/TAQ-2 SYSTEM Triannual Report No. 1, 15 Apr. - 14 Aug. 1977
Charles L. Shackelford Jan. 1978 13 p
(Contract DAAB07-77-C-2657; DA Proj. 1L7-62705-AH-94)
(AD-A050322; ITT-1062.11; ECOM-77-2657-1) Avail: NTIS HC A02/MF A01 CSCL 09/1

Design work on a long life X-ray tube for the AN/TAQ-2 System is discussed. Both a glass and ceramic envelope tube are to be built. The principal feature of the tubes is to be a single crystal tungsten anode. Author (GRA)

N78-20439# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
ESTIMATION OF DOPPLER SHIFT AND DIFFERENTIAL DOPPLER SHIFT
Peter M. Schultheiss Jun. 1977 87 p refs
(Contract N66001-76-C-1082)
(AD-A050284) Avail: NTIS HC A05/MF A01 CSCL 09/3

This report is concerned with the measurement of frequency (Doppler shift) by a collection of sensors which may be grouped into two or more clusters (subarrays). The signal may be a sinusoid, or it may be a narrowband Gaussian process whose center frequency is then the quantity of interest. For much, though not all, of the analysis, it is assumed that the noise is incoherent from sensor to sensor. The signal wavefront is assumed to be perfectly coherent over all sensors, but the angle subtended at the source by the various sensors may be sufficiently large so that differential Doppler shifts cannot be ignored. GRA

N78-20440# Army Construction Engineering Research Lab., Champaign, Ill.
EVALUATION OF INSTRUMENTATION FOR TESTING LARGE GENERATOR SETS
W. D. Ford and M. J. Pollock Feb. 1978 48 p refs
(AD-A050169; CERL-SR-E-121) Avail: NTIS HC A03/MF A01 CSCL 10/2

This report, which supplements CERL Special Report E-103, presents the results of an investigation of instrumentation for use in measuring and recording voltage and frequency changes during performance testing of large engine-generator sets intended for stationary electric power generation service in fixed military facilities. Based on analysis of (1) the specific characteristics needed to fulfill the end use for which the electric power will be produced and (2) the instrumentation currently described in MIL-HDBK-705B, inadequate instrumentation, primarily that used for transient measurement, was selected for replacement by advanced instrumentation. Five advanced instrumentation systems were selected for field testing based on their suitability for field testing, their recording capability, and their capability to measure in the desired range. The system which performed best in the field testing was the Gould 2200 Recorder. It is recommended that this recorder system, supplemented by a Dranetz line monitor to prevent accuracy problems caused by the Gould system's dependence on paper slip and pen width, be used for testing utility-grade and medium-grade power systems. Testing of precision-grade systems would require use of a transient digitizer system with subsequent computer analysis of the data. Author (GRA)

N78-20441# TRW, Inc., Lawndale, Calif. Semiconductor Div.
MONOLITHIC 20W 2 GHz TRANSISTOR AND MONOLITHIC 5W 4 GHz TRANSISTOR Quarterly Report, 16 May - 13 Sep. 1977
George Schreyer Oct. 1977 45 p refs
(Contract DAAB07-77-C-0431)
(AD-A049630; QR-1) Avail: NTIS HC A03/MF A01 CSCL 09/1

Wire bonding experiments on existing microwave dice were performed to determine optimum bonding configurations for microwave transistors. The results of these experiments guided the design of the active portion of the monolithic 2 GHz device, the L-10. To define a 4 GHz material specification, several lots of 4 GHz dice are being processed. The results of experiments on epitaxial resistivity and profile will guide the specification of PIN epitaxial material for the 4 GHz portion of the program. Author (GRA)

N78-20442# TRW Semiconductors, Inc., Lawndale, Calif. Semiconductor Div.
PRODUCTION ENGINEERING MEASURE FOR AN INTEGRATED CIRCUIT POWER AMPLIFIER 600-1000 MHz FOR TACTICAL RADIO EQUIPMENT Final Report, 29 Mar. - 31 Mar. 1977
Apr. 1977 178 p
(Contract DAAB05-72-C-5844)
(AD-A049508) Avail: NTIS MF A01 CSCL 17/2

Fifty amplifiers were RF tested and tuned during the two-week interval following the production run. An process specification the tuning procedure and the test setup used during this phase of the manufacturing process. The amplifiers were tuned with minimal effort, a result of the consistency of the batch processing techniques used in the manufacturing phase of the program. Transistor lot variation accounted for a considerable amount of the gain variation from unit to unit. Actual tuning was accomplished by soldering metal strips to the tuning pads incorporated in the ceramic substrate. This technique was found free of the tuning drift problems that were observed in amplifiers tuned with indium foil or conductive paints. At the completion of tuning the amplifiers exhibited a high degree of tuning position similarity. Author

N78-20443# Naval Postgraduate School, Monterey, Calif.
INFRARED DETECTION OF SURFACE CHARGE AND CURRENT DISTRIBUTIONS Final Report, 1 Dec. 1976 - 1 Dec. 1977 M.S. Thesis
James David Selim Dec. 1977 109 p refs
(AD-A050243; NPS62-77-001) Avail: NTIS HC A06/MF A01 CSCL 20/3

Knowledge of the charge and current distributions is essential in many applications of antenna design and placement, electromagnetic scattering, and electromagnetic compatability. Although it is possible to measure these quantities directly on a given object using electrically small probes, it is an extremely slow, tedious, and expensive process. To avoid this, computer analysis of structures has become increasingly important. These models require assumptions concerning geometry, wire size, boundary conditions, and the like. In all such investigations, model verification has become important. Clearly, a technique yielding real-time measurement of charge and current magnitude distributions has obvious advantages. GRA

N78-20444# Air Force Systems Command, Wright-Patterson AFB, Ohio.
PULSED X-RAY TUBE
N. I. Komyak, N. A. Dron, Ye. A. Peliks, V. M. Kurbatov, and Ye. I. Bichenkov 14 Sep. 1977 11 p Transl. into ENGLISH

from Patent (USSR), no. 273345, 15 Jun. 1970 p 1-2
(AD-A049388; FTD-ID(RS)T-1533-77) Avail: NTIS HC A02/MF A01 CSCL 09/1

This is an invention in the field of pulsed X-ray tubes, specifically, pulsed X-ray tubes with a cold cathode. We are familiar with pulsed X-ray tubes with a cold cathode, designed for work with a high voltage transformer source with an anode in the form of a metal rod, sharpened on the end, and a cathode in the form of a metal cylinder. Their main defect is their relatively short service life, related to destruction of the anode during the plasma discharges which occur in the tube (dulling of the anode needle). Moreover, the radiation intensity of such tubes is primarily the result of the electron current during the initial stage of the breakdown in the anode-cathode gap and the voltage at which this breakdown occurs. We know that breakdown voltage depends primarily on the transconductance of the leading front of high voltage pulse applied to the tube anode and has a very weak dependence on the distance between the anode and the cathode. The object of the invention was to create a pulsed X-ray tube with a greater service life and greater breakdown voltage in the discharge gap (above 10 to the 6th power V). GRA

N78-20445# Defence Research Establishment, Ottawa. (Ontario). Electrical Power Sources Div.

A POROUS ZINC ELECTRODE FOR USE AT VERY LOW TEMPERATURES

William A. Armstrong and Peter J. Powell Nov. 1977 25 p refs
(AD-A047787; DREO-765) Avail: NTIS HC A02/MF A01 CSCL 09/3

The structure of porous electrodes made from pressed dendritic zinc has been varied to improve the efficiencies of zinc utilization during low temperature discharges. The effects of varying the composition of the plating bath and the rate of deposition of dendritic zinc were investigated as was the use of different binders and current collectors. GRA

N78-20446# California Univ., Berkeley. Lawrence Berkeley Lab.

DESIGN OF SOLENOID MAGNETS USING LEGENDRE FUNCTIONS

M. A. Green and J. M. DeOlivares Aug. 1977 13 p refs Presented at 6th Intern. Conf. on Magnet Technol. Bratislava, 29 Aug. - 2 Sep. 1977
(Contract W-7405-eng-48)
(LBL-6716; Conf-770842-13) Avail: NTIS HC A02/MF A01

The magnetic field in a solenoid or Hemholtz type magnet can be represented by a Legendre function power series. Using modern computers, the coils of a solenoid or Hemholtz magnet can be designed to produce a field with desired characteristics. The Legendre function presentation can be used with certain iron configurations as well. The design of solenoid correction coils by use of this technique is presented. ERA

N78-20447# ASL Engineering, Goleta, Calif.

ELECTRIC/HYBRID VEHICLE DEVELOPMENT PLAN

[1978] 129 p refs
(Contract EY-76-C-03-1295)
(TID-27716) Avail: NTIS HC A07/MF A01

The problem of phasing this development effort into the requirements of H.R. 8800, and into limited commercial production is considered. As a consequence, the plan includes discussion of such factors as FMVSS compliance testing, durability and reliability testing, tooling, and marketing. The approach recommended for future phases of ERDA's electric vehicle program involves the development of three basic design approaches for the propulsion system, any of which can be incorporated into the same basic vehicle design. ERA

N78-20448# ASL Engineering, Goleta, Calif.

NEAR-TERM ELECTRIC VEHICLE PROGRAM, PHASE 1 Final Report

Aug. 1977 205 p refs
(Contract EY-76-C-03-1295)
(SAN/1295-1) Avail: NTIS HC A10/MF A01

A preliminary design study for a four passenger electric vehicle is described. Three major tasks were involved: (1) conceptual design/tradeoff study task in which design directions were established; (2) a preliminary design task which developed the designs in more detail; and (3) a development planning task which generated recommendations for a subsequent hardware development program. Each of these areas is discussed. The design and planning work was carried on under the guideline of using near term technology. Design aspects discussed include propulsion system; batteries/charger, body/structure, chassis system, accessories, and weight. ERA

N78-20449# National Bureau of Standards, Washington, D. C.

MEASUREMENT TECHNIQUES FOR HIGH POWER SEMICONDUCTOR MATERIALS AND DEVICES Annual Report, 1 Jan. - 31 Dec. 1976

D. L. Blackburn, R. Y. Koyama, F. F. Oettinger, and G. J. Rogers May 1977 92 p refs
(Contract EX-76-A-10-3800)
(CONS-3800-2) Avail: NTIS HC A05/MF A01

Application of a measurement technology will enable industry to: (1) make power semiconductor devices with greater uniformity of characteristics; (2) make devices with higher individual power handling capabilities; and (3) provide devices with the reliability and performance required in energy generation, utilization, and conservation. The major tasks under this project are to evaluate the technique for characterizing the resistivity uniformity of large diameter silicon wafers, and to evaluate the use of thermally stimulated current and capacitance measurements as a means for characterizing leakage source defects in silicon wafers. ERA

N78-20450# Brookhaven National Lab., Upton, N. Y.

Nb3Sn CONDUCTORS FOR ac POWER TRANSMISSION: ELECTRICAL AND MECHANICAL CHARACTERISTICS

J. F. Bussiere, V. Kovachev, C. Klamut, and M. Suenaga 1977 22 p refs Presented at the Cryog. Eng. Conf., Boulder, Colo., 2-5 Aug. 1977
(Contract EY-76-C-02-0016)
(BNL-22962; Conf-770801-12) Avail: NTIS HC A02/MF A01

Coaxial cable conductor designs which incorporate a thin Nb tape (approximately 20 microns thick) reacted to form Nb3Sn layers on each side (approximately 5 microns each) were described. The composite was either clad symmetrically with approximately 30 microns of copper on each side or asymmetrically with approximately 50 microns of copper on one side and approximately 20 microns stainless steel on the other. The copper was required for stabilization and the stainless steel provides additional strength which may be required during cable winding, handling and cooldown. The materials choices and trade offs associated with incorporating low-loss NbSn tapes into this type of composite are described. These include: (1) reducing the overall ac losses arising from the Nb3Sn, the unreacted Nb (or NbZr alloy) substrate and the copper/stainless steel laminates and (2) optimizing mechanical properties. ERA

N78-20451# Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.

STUDY OF THE SCALING OFF OF DEFECTS THAT LEAD TO THE OCCURRENCE OF PARTIAL DISCHARGES IN POLYETHYLENES USED FOR HIGH TENSION CABLE INSULATION Final Report [ETUDE DU PHENOMENE DE CICATRISATION DES DEFAUTS QUI ENTRAINENT LA PRODUCTION DE DECHARGES PARTIELLES DANS LES POLYETHYLENES DESTINES A L'ISOLATION DES CABLES HAUTE TENSION]

BuiAi, C. Huraux, O. Issa, and R. Lacoste 1 Jul. 1976 13 p refs In FRENCH
(Contract DGRST-75-7-0560)
(Publ-299) Avail: NTIS HC A02/MF A01

The addition of metal chelates to polyethylene increases the threshold of the appearance of partial discharges. Optimization of the results obtained was studied, prevention of disturbing interactions between chelates and antioxidants by suitable choice of additives was investigated and the behavior of the scaling off in time in relation to the physicochemical properties of the mixture (solubility, dispersion, diffusion) was studied. ESA

N78-20452# Paul Sabatier Univ., Toulouse (France). Lab. de Genie Electrique.

ELECTRICAL PROPERTIES OF POLYMERS: ORIENTATION EFFECT [PROPRIETES ELECTRIQUES DES POLYMERES: EFFET DE L'ORIENTATION]
BuiAi 1976 17 p refs In FRENCH Presented at the Conf. Orientation et Proprietes Induites des Polymeres a l'Etat Solide, 6-10 Dec. 1976
Avail: NTIS HC A02/MF A01

The following electrical properties of oriented polymers are discussed: resistivity; dielectric rigidity; piezoelectricity and complex permittivity. For every case the definition is recalled and the results obtained are presented. ESA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N78-20453 California Univ., Berkeley.
FALLING-FILM REWETTING OF A HOT VERTICAL SURFACE Ph.D. Thesis
Shyam Sunder Dua 1977 117 p
Avail: Univ. Microfilms Order No. 77-31337

Particular attention was given to the effect of precursory cooling caused by the droplet-vapor mixture ahead of the wet front in this study. A two-dimensional physical model was proposed that consists of an infinitely extended vertical surface with the dry region ahead of the wet front characterized by an exponentially decaying heat flux and the wet region behind the moving film front associated with a constant heat transfer coefficient. Apart from the two dimensionless constants describing the extent of precursory cooling ahead of the front, the physical problem was characterized by three dimensionless groups; the Peclet number or the dimensionless wetting velocity, the Biot number and a dimensionless temperature. Dissert. Abstr.

N78-20454 Miami Univ., Fla.
EXPERIMENTAL AND NUMERICAL STUDY OF CURRENT AND TEMPERATURE FIELDS IN LAKE BELEWS, AN ARTIFICIAL COOLING POND Ph.D. Thesis
Sudershan Kumar Mathavan 1977 437 p
Avail: Univ. Microfilms Order No. 77-30000

Existing techniques for the analysis of thermal discharges are limited in scope. Physical models have the limitation that all the similarity parameters cannot be satisfied simultaneously. Analytical models are limited to one or two dimensions. An attempt has been made in the present study to develop, calibrate, and verify a three-dimensional numerical rigid-lid model to predict current and temperature fields in cooling ponds. The study consists of extensive field monitoring, including infrared scanning of surface temperatures, measurement of ground truth temperatures, and in-situ measurements of currents and temperatures. The field data gathered is used to provide initial and boundary conditions for the mathematical model and also to provide data for the calibration and verification of the model. Dissert. Abstr.

N78-20455 Florida State Univ., Tallahassee.
TEMPERATURE WAVE PROPAGATION IN A NON-GRAY RADIATING FLUID Ph.D. Thesis
Tay-How Lee 1977 273 p
Avail: Univ. Microfilms Order No. 78-01493

Theoretical and experimental studies were carried out on the upward propagation of a temperature wave in a fluid, in which heat is transferred by both conduction and nongray radiation. A harmonic temperature oscillation was imposed on the lower boundary, and the attenuations in amplitude and changes in phase at different altitudes and under different conditions were investigated. Gaseous ammonia and nitrogen were respectively the radiating and nonradiating media selected for experiments and calculations. Spectroscopic data for frequencies, intensities, and widths of individual absorption lines in nine infrared bands of ammonia were determined from theoretical and empirical formulae. They were then compiled as parameters and used in a random absorption band model to obtain the modified emissivity functions, which are essential to the nongray radiative heating calculation. Dissert. Abstr.

N78-20456 Northwestern Univ., Evanston, Ill.
WAVE REFLECTION AND INTERFACE WAVES INVOLVING CAVITATION AT A FLUID-SOLID INTERFACE Ph.D. Thesis
Thambirajah Balendra 1977 123 p
Avail: Univ. Microfilms Order No. 7800685

The problem of reflection and refraction of waves was solved in closed form when the cavitation bubbles moved with a supersonic velocity with respect to the highest phase velocity of the system. A surface wave solution was obtained when the bubbles move with a subsonic velocity with respect to the Rayleigh wave velocity of the solid, while a leaky wave solution was obtained for intersonic velocities of the bubbles. It was shown that reflected and refracted waves undergo a phase shift and contain higher frequencies. The slopes of the bubbles at the trailing edges were discontinuous for all velocities of the bubbles. However, they were continuous at the leading edges for supersonic velocities. Accordingly, the normal tractions vanished at the leading edges for supersonic velocities, but otherwise had jump discontinuities at both edges of the bubbles. The existence of interface waves leading to cavitation was also investigated. Dissert. Abstr.

N78-20457*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
DRAG REDUCTION OBTAINED BY MODIFYING A STANDARD TRUCK
Arthur E. Sheridan and Steven J. Grier Feb. 1978 28 p refs (NASA-TM-72846; H-977) Avail: NTIS HC A03/MF A01 CSCL 20D

A standard two-axle truck with a box-shaped cargo compartment was tested to determine whether significant reductions in aerodynamic drag could be obtained by modifying the front of the cargo compartment. The coastdown method was used to determine the total drag of the baseline vehicle, which had a square-cornered cargo box, and of several modified configurations. Test velocities ranged from 56.3 to 94.6 kilometers per hour (35 to 60 miles per hour). At 88.5 kilometers per hour (55 miles per hour), the aerodynamic drag reductions obtained with the modified configurations ranged from 8 to 30 percent. Author

N78-20458*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE ROLE OF DROP VELOCITY IN STATISTICAL SPRAY DESCRIPTION
J. F. Groeneweg, M. M. El-Wakil (Wisc. Univ., Madison), P. S. Myers (Wisc. Univ., Madison), and O. A. Uyehara (Wisc. Univ., Madison) 1978 14 p refs Presented at 1st Intern. Conf. on Liquid Atomization and Spray Systems, Tokyo, 29-31 Aug. 1978
(NASA-TM-73887; E-9502) Avail: NTIS HC A02/MF A01 CSCL 20D

The justification for describing a spray by treating drop velocity as a random variable on an equal statistical basis with drop size was studied experimentally. A double exposure technique using fluorescent drop photography was used to make size and velocity measurements at selected locations in a steady ethanol spray formed by a swirl atomizer. The size velocity data were categorized to construct bivariate spray density functions to describe the spray immediately after formation and during downstream propagation. Bimodal density functions were formed by environmental interaction during downstream propagation. Large differences were also found between spatial mass density and mass flux size distribution at the same location. Author

N78-20459*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF COMMERCIALLY-AVAILABLE SPACECRAFT-TYPE HEAT PIPES
W. B. Kaufman and L. K. Tower 1978 16 p refs Proposed for Presentation at the 3d Intern. Heat Pipes Conf., Palo Alto, Calif., 22-24 May 1978; Sponsored by AIAA
(NASA-TM-78826) Avail: NTIS HC A02/MF A01 CSCL 20D

As part of an effort to develop reliable, cost effective spacecraft thermal control heat pipes, life tests on 30 commercially available

heat pipes in 10 groups of different design and material combinations were conducted. Results for seven groups were reported herein. Materials are aluminum and stainless steel, and working fluids are methanol and ammonia. The formation of noncondensible gas was observed for times exceeding 11,000 hours. The heat transport capacities of the pipes were also determined. Author

N78-20460*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

INFLUENCE OF FREE-STREAM DISTURBANCES ON BOUNDARY-LAYER TRANSITION

William D. Harvey Apr. 1978 33 p refs

(NASA-TM-78635; L-11905) Avail: NTIS HC A03/MF A01 CSCL 20D

Considerable experimental evidence exists which shows that free stream disturbances (the ratio of root-mean-square pressure fluctuations to mean values) in conventional wind tunnels increase with increasing Mach number at low supersonic to moderate hypersonic speeds. In addition to local conditions, the free stream disturbance level influences transition behavior on simple test models. Based on this observation, existing noise transition data obtained in the same test facility were correlated for a large number of reference sharp cones and flat plates and are shown to collapse along a single curve. This result is a significant improvement over previous attempts to correlate noise transition data. Author

N78-20461*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

RECENT TURBULENT DRAG REDUCTION RESEARCH AT LANGLEY RESEARCH CENTER

D. M. Bushnell Mar. 1978 11 p refs

(NASA-TM-78688) Avail: NTIS HC A02/MF A01 CSCL 20D

Three areas are discussed: oscillatory longitudinal curvature, large eddy breakup devices, and small longitudinal surface striations. The first two concepts produced sizable local turbulent skin friction reductions, but further research is required to optimize the effect, reduce parasitic device drag, and provide a net increase in vehicle performance. The surface striations, due to large wetted area increased for a given planform, have not yet yielded a planform-averaged skin friction reduction. Heat transfer data indicated such surfaces may have useful application in heat exchangers. Author

N78-20462*# Applied Research Lab., State College, Pa. Applied Research Lab.

TABULATION AND SUMMARY OF THERMODYNAMIC EFFECTS DATA FOR DEVELOPED CAVITATION ON OGIVE-NOSED BODIES

J. W. Holl, M. L. Billet, and D. S. Weir 30 Jan. 1978 130 p refs

(Grant NGL-39-009-001; Contract N00017-73-C-1418)

(NASA-CR-156136; TM-78-18) Avail: NTIS HC A07/MF A01 CSCL 20D

Thermodynamic effects data for developed cavitation on zero and quarter caliber ogives in Freon 113 and water are tabulated and summarized. These data include temperature depression (delta T), flow coefficient (C sub Q), and various geometrical characteristics of the cavity. For the delta T tests, the free-stream temperature varied from 35 C to 95 C in Freon 113 and from 60 C to 125 C in water for a velocity range of 19.5 m/sec to 36.6 m/sec. Two correlations of the delta T data by the entrainment method are presented. These correlations involve different combinations of the Nusselt, Reynolds, Froude, Weber, and Peclet numbers and dimensionless cavity length. Author

N78-20463*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

APPLICATION OF A TWO-DIMENSIONAL PARABOLIC COMPUTER PROGRAM TO PREDICTION OF TURBULENT REACTING FLOWS

John S. Evans, Charles J. Schexnayder, Jr., and H. L. Beach, Jr. Mar. 1978 59 p refs

(NASA-TP-1169) Avail: NTIS HC A04/MF A01 CSCL 20D

The capabilities of a computer program are explored, and computed results are compared with data. The comparisons are restricted to two-dimensional flows. Subsonic and supersonic flows, ducted and nonducted, reacting and nonreacting, are considered. An evaluation of models used for turbulence and chemical reaction was included. Constants in the dissipation rate of turbulent kinetic energy, turbulence model, which produces mixing in good agreement with data, are the same for all calculations. Experimental data are reported for coaxial injection at matched pressure (1 atm or 101.3 kPa) of a cold, Mach 2, hydrogen jet into a hot, Mach 2, vitiated airstream. Profiles of pitot pressure and gas composition obtained from water cooled probes are reported and compared with theoretical results. Author

N78-20464*# United Technologies Research Center, East Hartford, Conn.

ANALYSIS OF STRONG-INTERACTION DYNAMIC STALL FOR LAMINAR FLOW ON AIRFOILS Final Report

H. J. Gibeling, S. J. Shamroth, and P. R. Eiseman Apr. 1978 71 p refs

(Contract NAS1-13619)

(NASA-CR-2969; R77-912030-17) Avail: NTIS HC A04/MF A01 CSCL 20D

A compressible Navier-Stokes solution procedure is applied to the flow about an isolated airfoil. Two major problem areas were investigated. The first area is that of developing a coordinate system and an initial step in this direction has been taken. An airfoil coordinate system obtained from specification of discrete data points developed and the heat conduction equation has been solved in this system. Efforts required to allow the Navier-Stokes equations to be solved in this system are discussed. The second problem area is that of obtaining flow field solutions. Solutions for the flow about a circular cylinder and an isolated airfoil are presented. In the former case, the prediction is shown to be in good agreement with data. Author

N78-20465# Massachusetts Inst. of Tech., Cambridge. Fluid Dynamics Research Lab.

WAVE BACK-INTERACTION ON INVISCID SHEAR FLOWS Interim Report

Wilson C. Chin 1 Aug. 1977 41 p refs

(Grant AF-AFOSR-2730-74)

(AD-A050412; Rept-77-1; AFOSR-78-0160TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The nonlinear interaction between a slowly varying wavetrain and an inviscid shear flow is treated by a Whitham-type averaging of the oscillations over a rapidly varying phase variable and integration over the modal cross-space of the basic fluid-dynamical conservation laws. The modulation equations so derived (together with a kinematic requirement for wave conservation) govern coupled nonlinear changes between wave and mean flow variables, and extend Whitham's ideas for irrotational mean flows to waves riding on inviscid shear flows. The key idea in the analysis is an additional Stuart-Watson type 'shape assumption' for the mean flow to account for wave-induced distortions to the basic shape of the mean velocity profile. The Ansatz used is based on the local picture furnished by inviscid, nonlinear normal mode theory, this description being representative of truly slowly varying flows. Some applications are given and some possible physical consequencies of the theory are discussed. Author (GRA)

N78-20466# RAND Corp., Santa Monica, Calif.

APPROXIMATE METHODS FOR CALCULATING THE PROPERTIES OF HEATED LAMINAR BOUNDARY LAYERS IN WATER Interim Report

G. M. Harpole, S. A. Berger, and J. Aroesty Jan. 1978 33 p refs

(Contract DAHC15-73-C-0181; ARPA Order 189)

(AD-A050372; RAND/R-2165-ARPA) Avail: NTIS HC A03/MF A01 CSCL 20/4

A laminar boundary layer integral method (the method of Thwaites and Walz) is extended to handle variable fluid properties. This integral method uses simple correlations of universal parameters based on similar boundary layer flows. These universal parameters are correlated for water, which has a strongly temperature dependent viscosity, based on numerical solutions of heated water wedge flows. This extended integral method, in conjunction with the Lighthill high-Prandtl-number approximation

for heat transfer, can be used to compute displacement thickness, momentum thickness, wall shear stress, Nusselt number, and higher derivatives of the velocity and temperature profiles at the wall for nonsimilar boundary layers. These parameters can be computed with a hand calculator. The extended integral method is tested for the highly nonsimilar Howarth retarded flow with t sub w = 104 F and t sub e = 32 F; the method is accurate for this flow, except in the region near separation. Author (GRA)

N78-20467# Ballistic Research Labs., Aberdeen Proving Ground, Md.

CRITICAL REVIEW OF ONE-DIMENSIONAL TUBE FLOW EQUATIONS Final Report

Aivars K. R. Celmins Oct. 1977 62 p refs

(AD-A050371; BRL-2025) Avail: NTIS HC A04/MF A01 CSCL 20/4

Flows through ducts or pipes are often analyzed theoretically and numerically using one-dimensional flow equations. Generally it is assumed that the equations describe relations between average flow properties and that they are adequate if the axial component of the flow dominates. This paper reviews the derivation of the governing equations. It is shown that equations which are traditionally used for tube flows have a very limited scope of applicability. Their theoretical validity is in essence restricted to steady incompressible flows. In cases of more complicated flows some terms in the traditional momentum and energy equations can be in error by up to 50%. It is also shown that the popular approximation of the energy dissipation function by the product of the average velocity and average shear stress is appropriate for the simplest flows only. The paper reveals shortcomings of traditional methods of derivations of tube flow equations and provides explicit formulas for correction terms which should be used in the governing equations. GRA

N78-20468# Ballistic Research Labs., Aberdeen Proving Ground, Md.

A PHYSICAL MODEL FOR COMPUTING FLUID FLOW SOLUTIONS Final Report

William P. Wright Sep. 1977 70 p

(AD-A050306; BRL-2012) Avail: NTIS HC A05/MF A01 CSCL 20/4

A physical and mathematical scheme is described which can be the basis for the construction of a computer program designed to solve fluid flow problems important to the U.S. Army. Essentially the scheme consists of the determination of contributions of moments of physical quantities over Lagrangian cells of fluid, which move according to the local fluid velocity to neighboring fixed cells. Based on the sums of these contributions of moments, new distributions across the fixed cells are determined which correspond to fluid flow during an elapse of a finite interval of time. The moments of the physical quantities over subregions of the Lagrangian cells are evaluated by utilizing a set of integral equations which are derived in the report. Author (GRA)

N78-20469# Naval Ship Research and Development Center, Bethesda, Md. Performance Dept.

CAVITATION INCEPTION OBSERVATIONS ON TWO AXISYMMETRIC HEADFORMS

Thomas T. Huang and Nicholas Santelli Dec. 1977 38 p refs (SF43452702)

(AD-A050138; SPD-807-01) Avail: NTIS HC A03/MF A01 CSCL 20/4

Cavitation inception observations on two axisymmetric headforms were made in the DTNSRDC 36-inch water tunnel. The results indicate that cavitation inception on a headform with natural flow transition is significantly affected by the air content of the water. The effect of air content on cavitation inception on a headform with laminar separation is less pronounced. Visible cavitation inception never occurred at the locations of minimum static pressure but was observed to occur in the region of natural transition and the separated shear layer following laminar separation. It is concluded that both the viscous effects and cavitable microbubble population are extremely important parameters governing the cavitation inception process.

Author (GRA)

N78-20470# Pennsylvania State Univ., University Park. Applied Research Lab.

THE LAMINAR VELOCITY PROFILE IN A FLAT PLATE BOUNDARY LAYER WITH SURFACE ROUGHNESS

G. H. Hoffman and J. L. Lumley 11 May 1977 19 p refs (Contract N00017-73-C-1418)

(AD-A050198; TM-77-150) Avail: NTIS HC A02/MF A01 CSCL 20/4

The theory of Singh and Lumley for the effect of surface roughness on a laminar boundary layer is applied to flow past a semi-infinite flat plate where the roughness is a randomly distributed small amplitude waviness characteristic of the manufacturing process. Distorted velocity profiles are calculated for a range of parameters and comparisons are made with results obtained by a phenomenological theory. Present results are nearly an order of magnitude smaller than those predicted by the phenomenological theory. Author (GRA)

N78-20471# Los Alamos Scientific Lab., N. Mex.

CONCEPTUAL DESIGN OF A HEAT PIPE RADIATOR

G. A. Bennett Sep. 1977 13 p refs

(Contract W-7405-eng-36)

(LA-6939-MS) Avail: NTIS HC A02/MF A01

A conceptual design of a waste heat radiator was developed for a thermoelectric space nuclear power system. The basic shape of the heat pipe radiator was a frustum of a right circular cone. The design included stringer heat pipes to carry reject heat from the thermoelectric modules to the radiator skin that was composed of small diameter, thin walled cross heat pipes. The stringer heat pipes were armored to resist puncture by a meteoroid. The cross heat pipes were designed to provide the necessary unpunctured radiating area at the mission end with a minimum initial system mass. Several design cases were developed in which the individual stringer survival probabilities were varied and the radiator system mass was calculated. Results were presented for system mass as a function of individual stringer survival probability for six candidate container materials, three candidate heat pipe fluids, two radiator operating temperatures, two meteoroid shield types, and two radiating surface cases.

ERA

N78-20472# Argonne National Lab., Ill. Components Technology Div.

RESOLUTION OF GEOMETRICAL CONFIGURATIONS BY A 3-D STAGGERED MESH SYSTEM

H. M. Domanus and William T. Sha Jan. 1977 26 p refs (Contract W-31-109-eng-38)

(ANL-CT-77-10) Avail: NTIS HC A03/MF A01

Any computer program development of thermal hydraulic analyses must begin with a relationship between the grid system and the geometric configuration. The relationship chosen sets the limits of possible applications and affects virtually all programming details of the code. In the COMMIX code development, a staggered mesh system was employed in finite differencing the governing differential equation. A methodology was developed to extend applications of the staggered mesh system to complicated three dimensional geometrical configurations. The methodology presented employs x-y-z Cartesian coordinates and modifies the finite differencing equations to resolve irregular three dimensional geometrical configurations in a staggered mesh system. More important, it lends itself to a consistant approach to handle various types of boundary conditions. ERA

N78-20473# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Chemical Engineering.

SYNTHOIL HYDRODYNAMICS Final Report

H. Brenner, D. C. Prieve, and B. Fitch Mar. 1977 11 p

(Contract EY-76-S-02-0056)

(COO-0056-4) Avail: NTIS HC A02/MF A01

Mathematical models to explain and correlate the experimental data concerning two phase cocurrent upflow through packed beds, as found in the Synthoil reactor and the associated cold-model were developed. Such correlation and understanding will be useful in scale-up as well as optimum design of the reactor. ERA

N78-20474# Energy Research and Development Administration, Morgantown, W. Va.

DIFFUSIVITY MODEL FOR FLUID FLOW AND HEAT

CONDUCTION IN POROUS MEDIA
W. K. Sawyer and J. C. Mercer May 1977 144 p refs (MERC/SP-77/2) Avail: NTIS HC A07/MF A01

A revised version of a three dimensional finite difference diffusivity model is presented with the capability of simulating horizontal or vertical induced fractures by several different methods. Fractures may be of finite, semi-infinite, or infinite flow capacity. In addition to simulating gas, liquid, or heat flow in a heterogeneous, anisotropic fractured media this model (1) relates block pressures to wellbore pressures through radial flow equations, (2) is unlimited in the number of time-steps per run, (3) offers three different implicit solution algorithms, (4) will simulate pressure (temperature) or rate pulse tests, (5) accumulates elapsed time, total production, and material balance errors, (6) can begin each run with any pressure distribution in one of two different formats, and (7) can be used with a mixture of hydrocarbon gases containing up to 14 components over reduced temperature and pressure ranges of 1.1 to 3.0 and 1.1 to 20.0, respectively. ERA

N78-20475# Argonne National Lab., Ill. Components Technology Div.
EFFECT OF FLUID VISCOSITY ON COUPLED TUBE/FLUID VIBRATIONS
Tsyh-tyan Yeh and Shoei-sheng Chen Apr. 1977 48 p refs (Contract W-31-109-eng-38)
(ANL-CT-77-24) Avail: NTIS HC A03/MF A01

In many reactor system components, in order to accommodate thermal expansion and to facilitate assembly, very frequently there exist small gaps among various structural and mechanical components. The gaps are usually containing flowing viscous fluid to maintain temperature in a specific range. The fluid in the gap will affect the component dynamic characteristics. Two coaxial tubes separated by a viscous fluid are studied theoretically. The fluid forces acting on the tubes associated with small tube displacements are obtained in closed form based on the linearized Navier Stokes equation. Once the fluid force coefficients are calculated, free and forced vibrations of the coupled tube/fluid system can then be analyzed. Numerical results are presented for several cases to illustrate the effect of various system parameters. ERA

N78-20476# Institut Franco-Allemand de Recherches, St. Louis (France).
THERMAL CONDUCTION IN A THIN METAL PLATE IRRADIATED BY AN INTENSE LASER BEAM [CONDUCTION DE LA CHALEUR DANS UNE PLAQUE METALLIQUE MINCE ILLUMINEE PAR UN FAISCEAU LASER INTENSE]
B. Gautier 29 Nov. 1976 35 p refs In FRENCH
(ISL-R-138/76) Avail: NTIS HC A03/MF A01

The heating of a finite thickness metal plate under the influence of a laser beam was determined using a numerical method allowing the temperature dependence of the absorption coefficient to be taken into consideration. In addition, a parameter was identified the value of which confirms the validity of the assumption of a thermally thin material at practically uniform temperature. The effect of an air flow tangential to the plate on plate heating under laser irradiation was investigated using this assumption. It was shown that an intensity threshold occurs, below which destruction by melting of such a target is impossible. ESA

N78-20360# General Dynamics Corp., Groton, Conn. Electric Boat Div.
UNDERWATER FLUID STRUCTURE INTERACTION. PART 3: ACOUSTICALLY-APPLIED FORCES
L. H. Chen and M. Pierucci *In* Shock and Vibration Inform. Center. The Shock and Vibration Digest, Vol. 9, No. 6 Jun. 1977 p 13-17 refs (For availability see N78-20358 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375 CSCL 20K

N78-20364# Argonne National Lab., Ill.
FLOW-INDUCED VIBRATIONS OF CIRCULAR CYLINDRICAL STRUCTURES. PART 2: CROSS-FLOW CONSIDERATIONS
S. S. Chen *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 11 Nov. 1977 p 21-27 refs (For availability see N78-20361 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N78-20477 Ohio State Univ., Columbus.
IMAGING CAPABILITIES OF GERMANIUM GAMMA CAMERAS Ph.D. Thesis
John Wilson Steidley 1977 300 p
Avail: Univ. Microfilms Order No. 7731990

Quantitative methods of analysis based on the use of a computer simulation were developed and used to investigate the imaging capabilities. The imaging capabilities were assessed using low contrast lesion source distribution. The interpretation of the imaging capabilities was based on two methods: (1) the simplifying assumption of unlimited image statistics is removed by assuming an ideal statistical observer; (2) perception of contrast differences in film without consideration of statistical effects. Receiver-operating-characteristic (ROC) curves and ROC indices of detectability were then used to compare various imaging systems. The results of the computer simulation were also used to compare a design of a hypothetical germanium gamma camera with a state-of-the-art scintillation camera. In particular, the trade-off between collimator resolution and collimator efficiency for detection of a given low contrast lesion was directly addressed. Dissert. Abstr.

N78-20478 Stanford Univ., Calif.
ON-LINE PARAMETER ESTIMATION AND CONTROL FOR A ROTATING GRAVITY GRADIOMETER Ph.D. Thesis
Eugene John Pelka 1977 265 p
Avail: Univ. Microfilms Order No. 7802214

A technique was proposed for estimating and then approximately nulling certain systematic error parameters of a two arm rotating gravity gradiometer (RGG). The errors included mass unbalance, elasticity mismatch, axial-torsional coupling, and axial misalignments. The parameter estimator used phase sensitive signal demodulation. Input signals implemented through a precision inertial platform were required. Parameter control involved displacement of small masses located on the arms of the RGG. Analysis is presented which indicates that the overall error for a vehicle-borne RGG can be reduced to 1 EU by a combination of active parameter control and correction of the residual errors through analytical compensation of the RGG output. Optimal relative instrument orientations for gradient measurement systems were derived. Systems of three and four gradiometers were considered. Dissert. Abstr.

N78-20479 Materials Research Labs., Melbourne (Australia).
METHOD OF OPERATION OF THE MRL INTERFEROMETRIC MANOMETER
D. J. Hatt and D. B. Prowse Jul. 1977 19 p refs (MRL-TN-403; AR-000-661) Copyright. Avail: Issuing Activity

Instructions are given for the mechanical and electrical operation of a U-tube manometer in which the mercury surfaces are the reflectors of a Michelson interferometer and the heights of the mercury surfaces are detected and measured by laser interferometry techniques using a helium-neon laser. Special floats made from stainless steel and tungsten, and incorporating a cat's eye, are used in each tube to reduce the effects of vibration. The U-tube and the laser interferometer are mounted on a cast-iron surface plate which in turn is borne by a 5 tone concrete block supported by air-operated antivibration mountings. Vacuum pumps and associated plumbing are also mounted on the surface plate.

Procedures for installing the floats and for adjusting and aligning the optical system are included. Author

N78-20480*# North Alabama Scientific and Engineering Consultants, Inc., Huntsville.
HOLOGRAPHIC ANALYZER AND IMAGE SCANNER Final Report
28 Feb. 1978 7 p
(Contract NAS8-32593)
(NASA-CR-150624) Avail: NTIS HC A02/MF A01 CSCL 14E

The characteristics, components, and operating procedures are described for a holographic camera real images projection displayer and scanner unit having the capability to upgrade to multiple types of automated raster scan patterns. Schematics of the optical components are included with a diagram of the electric circuit connections. Author

N78-20481*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INVESTIGATION OF A HIGH SPEED DATA HANDLING SYSTEM FOR USE WITH MULTISPECTRAL AIRCRAFT SCANNERS
W. Lane Kelly and Barry D. Meredith Mar. 1978 42 p
(NASA-TM-78689) Avail: NTIS HC A03/MF A01 CSCL 14B

A buffer memory data handling technique for use with multispectral aircraft scanners is presented which allows digital data generated at high data rates to be recorded on magnetic tape. A digital memory is used to temporarily store the data for subsequent recording at slower rates during the passive time of the scan line, thereby increasing the maximum data rate recording capability over real-time recording. Three possible implementations are described and the maximum data rate capability is defined in terms of the speed capability of the key hardware components. The maximum data rates can be used to define the maximum ground resolution achievable by a multispectral aircraft scanner using conventional data handling techniques. Author

N78-20482# Defence Research Establishment, Ottawa. (Ontario). NBC Defence Div.
A HIGH-RANGE SOLID-STATE RADIACMETER WITH DIGITAL DISPLAY
S. McGowan Jun. 1977 25 p refs
(AD-A044283; DREO-TN-77-10) Avail: NTIS HC A02/MF A01 CSCL 18/4

A high-range radiacmeter using a solid-state detector and a digital readout has been designed and constructed. The detector is an inexpensive silicon diode of area 0.8 square millimeters developed for use as a photodiode. The instrument is capable of measuring dose rates from 0.1 to 999 rad/h, readout being provided by a three-digit LED display with automatic range switching. Author (GRA)

N78-20483# Harris Corp., Melbourne, Fla. Electronic Systems Div.
HOLOGRAM REPLICATION INVESTIGATION Final Technical Report, 30 Jun. 1976 - 30 Jun. 1977
R. G. Zech, L. M. Ralston, T. R. Bader, and B. R. Redderson Griffiss AFB, N.Y. RADC Dec. 1977 201 p
(Contract F30602-76-C-0382)
(AD-A050419; RADC-TR-77-388) Avail: NTIS HC A10/MF A01 CSCL 14/5

Techniques for replicating silver fiche containing up to 30-million bits of digital information were investigated. The digital data are stored in the form of 68-bit 1.2 micrometer x 1.5 mm computer-generated holograms, which are generated with the RADC HRMR Microfiche Mass Memory System. Replication was shown to solve several problems. First, it makes available on a rapid cost-effective basis a multiplicity of unit records for internal and remote dissemination. Second, it compensates for a systematic resolution limitation of the HRMR Recorder. By exploiting the inherent nonlinearity of most light-sensitive media, a contrast enchancement is effected that results in significant signal-to-noise ratio and diffraction efficiency improvements. In addition, bit intensity rolloff across the signal bandpass is minimized. The approach of the Hologram Replication Investigation was to first identify and characterize commercial duplication films and then to use the most promising recording media to study and optimize first and second generation HRMR fiche replication. GRA

N78-20484# Air Force Systems Command, Wright-Patterson AFB, Ohio.
PROSPECTS FOR HOLOGRAPHY
N. Jewtichijew and D. Mirowicki 1 Sep. 1977 15 p Transl. into ENGLISH from Elektronika (Poland), no. 9, 1972 p 353-355
(AD-A049389; FTD-ID(RS)T-1470-77) Avail: NTIS HC A02/MF A01 CSCL 20/6

This document presents some of the more important, and more promising possibilities for future application of holography in the following scientific and engineering fields: optics; radionavigation, radiolocation and radioastronomy; acoustics, hydroacoustics and echo ranging; technology; in mathematical machines and cybernetic apparatus; in physics research; and in photography, film and television. GRA

N78-20485# Oak Ridge Y-12 Plant, Tenn.
FILAMENT POWER REGULATOR FOR THERMAL IONIZATION MASS SPECTROMETRY
V. E. R. Rogers and J. R. Ferguson 15 Sep. 1977 14 p refs
(Contract W-7405-eng-26)
(Y-2091) Avail: NTIS HC A02/MF A01

A device was developed that controls the filament temperature in a thermal ionization mass spectrometer. The arrangement is superior to past methods to control this critical parameter. The operating principle lies in the feature of filament power control as contrasted with the formerly used voltage or current controls. Reproducibility and stability of ion beams showed great improvement. The mass spectrometer was developed to analyze for parts per-billion concentrations of uranium in water samples. ERA

N78-20486# Argonne National Lab., Ill.
SCINTILLATION SPECTROMETER SYSTEM FOR MEASURING FAST-NEUTRON SPECTRA IN BEAM GEOMETRY
G. G. Simons, J. M. Larson, and R. S. Reynolds (Mississippi State Univ., Mississippi State) May 1977 38 p refs
(Contract W-31-109-eng-38)
(ANL-77-58) Avail: NTIS HC A03/MF A01

A high-energy liquid-organic scintillation spectrometer system is described. This spectrometer was developed to measure neutron spectra in extracted beams from zero-power fast reactors. The highly efficient NE-213 scintillation solution was used as the neutron detection medium. Identification and removal of gamma-ray-induced events were accomplished using electronic pulse shape discrimination. Instrumentation used to process the discrete pulses stemming from neutron and gamma-ray interactions, within the scintillation solution, is described in detail. Evaluation of the system's performance is discussed for a gamma-ray discrimination ratio of nominally 1000:1, a total countrate of 3000 cps, and a dynamic range corresponding to neutron energies from 1 to 10 MeV. Neutron specta are reported for extracted beam measurements made on ZPPR assembly 4, phase 2. ERA

N78-20487# Danish Meteorological Inst., Copenhagen.
THE QHM. CONTRIBUTIONS TO THE THEORY AND PRACTICE OF THE QUARTZ HORIZONTAL MAGNETOMETER
E. KringLauridsen 1977 112 p refs
(DMI-Geophys-Papers-R-50; ISBN-87-7478-138-3) Avail: NTIS HC A06/MF A01

Use experience with the quartz horizontal magnetometer (QHM) developed in the Thirties at the Danish Meteorological Institute for the measurement of the horizontal component H of the earth's magnetic field is presented. The effects of residual torsion, elastic creep, temperature, humidity, and different measuring speeds and schemes are discussed. Other topics dealt with include dependence of main constants on torsion and time; permanent magnetism in the housing of the QHM; change of dip angle; measurement of b and related sources of error; and assembly, adjustment, and calibration of QHM's. ESA

36 LASERS AND MASERS

Includes parametric amplifiers.

N78-20488 California Univ., Irvine.
STATISTICAL CHARACTERIZATION OF LASER PROPAGATION THROUGH LABORATORY GENERATED ATMOSPHERIC TURBULENCE Ph.D. Thesis
Arun Kumar Majumdar 1977 93 p
Avail: Univ. Microfilms Order No. 7802431

A turbulence chamber was designed and built to generate locally homogeneous, isotropic turbulence within a well defined region. A computer controlled micro-thermocouple system was constructed to measure the structure function of temperature fluctuations within the chamber. From these results Kolmogorov's 2/3 law was established within a certain region. For the optical case, irradiance fluctuations of a collimated laser beam propagating through turbulence were measured. Statistics of the fluctuations were analyzed by measuring coefficients of variation gamma sub 0, skewness gamma, excess gamma sub 2, and histograms. Dissert. Abstr.

N78-20489*# Physical Sciences, Inc., Woburn, Mass.
ANALYTICAL STUDY OF LASER SUPPORTED COMBUSTION WAVES IN HYDROGEN Final Report, 10 Dec. 1976 - 4 Dec. 1977
N. H. Kemp and R. G. Root Aug. 1977 119 p refs
(Contract NAS3-20381)
(NASA-CR-135349; PSI-TR-97) Avail: NTIS HC A06/MF A01 CSCL 20E

A one-dimensicnal energy equation, with constant pressure and area, was used to model the LSC wave. This equation balances convection, conduction, laser energy absorption, radiation energy loss and radiation energy transport. Solutions of this energy equation were obtained to give profiles of temperature and other properties, as well as the relation between laser intensity and mass flux through the wave. The flow through the LSC wave was then conducted through a variable pressure, variable area streamtube to accelerate it to high speed, with the propulsion application in mind. A numerical method for coupling the LSC wave model to the streamtube flow was developed, and a sample calculation was performed. The result shows that 42% of the laser power has been radiated away by the time the gas reaches the throat. It was concluded that in the radially confined flows of interest for propulsion applications, transverse velocities would be less important than in the unconfined flows where air experiments have been conducted. Author

N78-20490*# National Aeronautics and Space Administration, Washington, D. C.
PROBLEMS OF ATOMIC REACTOR-LASERS
L. I. Gudzenko and S. I. Yakovlenko Sep. 1977 42 p refs Transl. into ENGLISH from Tr. Fiz. Inst., Akad. Nauk SSSR (Moscow), v. 90, 1976 p 99-123 Transl. by Sci. Transl. Serv., Santa Barbara, Calif.
(Contract NASw-2791)
(NASA-TM-75145) Avail: NTIS HC A03/MF A01 CSCL 20E

The preliminary directions to be pursued in correcting and implementing basic atomic reactor-laser concepts are outlined. The basic measures to be followed in implementing such systems are discussed. Author

N78-20491# Defence Research Establishment Valcartier (Quebec).
AN EFFICIENT, PURELY CHEMICAL HCl LASER
K. D. Foster, R. D. Suart, and D. R. Snelling Nov. 1976 26 p refs
(AD-A036291; DREV-R-4059/76) Avail: NTIS HC A03/MF A01 CSCL 20/5

Purely chemical laser emission at 3.6 to 4 micrometers from HCl has been achieved in a transverse flow device. The pumping reaction was the well-known Cl + HI yield HCl + I reaction. Atomic chlorine was produced chemically from the reaction of NO with ClO2. The maximum power obtained from this system was 4 W, which corresponded to a chemical efficiency of 9% based upon the fraction of pumping reaction energy that goes into vibration. GRA

N78-20492# Defence Research Establishment Valcartier (Quebec).
OPTIMIZATION OF THE PRE-PUMPING NO/ClO2 CHEMISTRY IN A PURELY CHEMICAL HCl LASER
K. D. Foster, D. R. Snelling, R. D. Suart, and S. J. Arnold Jan. 1977 40 p refs
(AD-A037304; DREV-R-4060/77) Avail: NTIS HC A03/MF A01 CSCL 20/5

The laser output at 3.8 micrometers from a purely chemical HCl laser was used to obtain information about the pre-pumping chemistry of the NO/ClO2 system. The reaction of chemically produced chlorine atoms with hydrogen iodide was the laser pumping reaction. Successful laser operation was confirmed using three different kinetic or chemical modes. These modes are distinguishable by whether the chlorine enters the optical (laser) region directly in the form of chlorine atoms, ClO radicals or parent ClO2 molecules. A comparison of experimental results for the latter two modes, using computer simulation results for the time evolution HCl, showed that the main features of the coupling of the pumping reaction to the pre-pumping chemistry are understood. Author (GRA)

N78-20493# Defence Research Establishment Valcartier (Quebec).
STEADY STATE THERMAL BLOOMING OF MULTIPULSE LASER BEAMS
L. R. Bissonnette Feb. 1977 36 p refs
(AD-A037218; DREV-R-4067/77) Avail: NTIS HC A03/MF A01 CSCL 20/5

Steady state thermal blooming of multipulse laser beams subjected to cross winds is studied in the light of numerical solutions. Enhancement resulting in a 100% increase of the peak irradiance with respect to the non-bloomed but linearly absorbed beam is demonstrated at the optimal pulsing rate. The corresponding gain in terms of spatially averaged power density over the target area containing 85% of total power is 40%. A parametric study is made as a function of three similarity parameters which are sufficient to completely define the problem: the number kappa which is the reciprocal of the number of pulses per flow time, the Fresnel number F based on the absorption-irradiance interaction length scale and the absorption number gamma related to linear depletion. Optimal conditions for a collimated Gaussian beam are shown to exist for 0.8 approximately less than kappa approximately less than 1.0 and F approximately greater than 20. Intensification generally decreases with increasing gamma but only slightly. Author (GRA)

N78-20494# Defence Research Establishment Valcartier (Quebec).
PURELY CHEMICAL HYDROGEN CHLORIDE LASER BASED UPON THE REACTION OF CHLORINE ATOMS WITH HYDROGEN BROMIDE
K. D. Foster, D. R. Snelling, S. J. Arnold, and R. D. Suart Mar. 1977 28 p refs In ENGLISH; FRENCH summary
(AD-A038506; DREV-R-4071/77) Avail: NTIS HC A03/MF A01 CSCL 20/5

Laser emission from vibrationally excited HCl has been achieved in a transverse flow system whose pumping energy relied upon the reaction Cl + HBr yields HCl Br. For these experiments the chlorine atoms were produced in situ from the chemical reaction of NO with ClO2. The observed maximum output power of 0.34 W was approximately one third the output power if hydrogen iodide was substituted for HBr. Loss of HCl vibrational quanta through collisions with HBr is believed to be a severe limitation on Cl + HBr system and probably accounts for the reduced HCl laser efficiency of Cl HBr compared with Cl + HI along with the reduced exothermicity of the pumping reaction. Author (GRA)

N78-20495# Army Electronics Command, Fort Monmouth, N. J.
MEASUREMENTS REQUIRED FOR PREDICTION OF HIGH ENERGY LASER TRANSMISSION Research and Development Technical Report
Wendell R. Watkins, Kenneth O. White, Charles W. Bruce, Donald L. Walters, and James D. Lindberg Dec. 1977 31 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A049628; ECOM-5834) Avail: NTIS HC A03/MF A01 CSCL 20/5

Accurate predictive models are required for design, testing, and field use of high energy laser systems. The success of these models for transmission predictions including linear and nonlinear effects is made possible only by the availability of a good atmospheric parameter data base which must include turbulence, crosswind, gaseous absorption, and aerosol extinction. A review is given herein of the status of this data base for White Sands Missile Range, the effects recent measurements made by the Atmospheric Sciences Laboratory have on high energy laser transmission predictions, and facility capabilities available with plans to resolve remaining problem areas. No attempt is made to select the best laser source, but several effects are discussed which may have direct bearing on such a choice. Author (GRA)

N78-20496# Harry Diamond Labs., Adelphi, Md.
FEASIBILITY STUDY OF RARE EARTH SEMICONDUCTOR LASERS OF THE TYPE Y2HfS5
Clyde A. Morrison, Nick Karayianis, and Donald E. Wortman Dec. 1977 21 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A049623; HDL-TR-1836) Avail: NTIS HC A02/MF A01 CSCL 20/5

The possibility of making a rare earth or rare earth doped semiconductor laser is investigated. The material examined in detail is Y2HfS5, which is of the general class of materials Ln2TX5, where Ln is a rare earth, T is zirconium or hafnium, and X is sulfur or selenium. For Y2HfS5:Nd, the Stark split energy levels of Nd(3+) are determined in the energy range 0 to 2 eV (the band gap of Y2HfS5). The individual line to line transition probabilities are calculated assuming S4 symmetry for the Nd(3+) site, and the branching ratios are given. The calculated branching ratio for spontaneous emission of the 4F (3/2) to the 4I (1/2) is 0.574, and the next largest branching ratio of the 4F (3/2) to 4I (9/2) is 0.298. The branching ratio for the 4I (1/2) is larger in this material than the calculated branching ratio for Nd in YAG, which is 0.480. The transition probabilities are used to calculate the excitation of the various multiplets by conduction electrons. Author (GRA)

N78-20497# University of Southern Calif., Los Angeles.
EXCIMER POTENTIAL CURVES Annual Report, 1 Oct. 1976 - 31 Dec. 1977
H. S. Taylor, M. Valley, C. Watts, and F. Bobrowicz 1 Feb. 1978 71 p refs
(Contract N00014-77-C-0102; ARPA Order 2840)
(AD-A050471; AR-1) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report describes the present status of our effort to develop and implement semi-empirical and theoretical methods for obtaining potential curves of diatomic excimer systems. A configuration interaction calculation on GaKr is presented along with preliminary results of a Gordon-Kim calculation. The basic theory of the semi-empirical electron scattering model is also given. Author (GRA)

N78-20498# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
EXPERIMENTAL PERFORMANCE OF A 15 KILOWATT CW CO2 ELECTRIC DISCHARGE LASER Final Report, Jan. 1976 - Jul. 1977
D. C. Rabe Nov. 1977 30 p refs
(AD-A050469; AFAPL-TR-77-74) Avail: NTIS HC A03/MF A01 CSCL 20/5

The fabrication and initial experimental checkout of an Electric Discharge Laser (EDL) System is described. This continuous wave carbon dioxide laser extracts power in excess of 12 kilowatts routinely at an electrical discharge efficiency of 27% and a mass flow efficiency in excess of 100 Kw/1bm/sec. With the current resonator optics, the output intensity distribution is circular, uniform and repeatable to within 5%. This laser has performed over 8,000 experiments ranging from 1 to 10 seconds in duration. Author (GRA)

N78-20499# Hughes Research Labs., Malibu, Calif.
STUDY OF SURFACE FINISHING AND COATING OF DF LASER WINDOWS Annual Technical Report, 1 Apr. 1976 - 31 May 1977
J. A. Harrington, M. Braunstein, B. Garcia, and J. E. Rudisill Jul. 1977 38 p refs
(Contract N00014-75-C-0891)
(AD-A050443) Avail: NTIS HC A03/MF A01 CSCL 20/5

Research was conducted into the minimization of optical absorption in low-loss window and coating materials for use in high-power DF chemical lasers. Candidate coating materials that were investigated as single-layer, half-wave thick films at 3.8 micron include PbF2, ThF4, ZnSe, Si, MgO, Al2O3, LiF, and NaF on CaF2 substrates. Of these, the fluorides have the lowest absorption losses and the Si and oxide films have the largest. A thorough study of extrinsic absorptions in ThF4 and ZnSe films on CaF2 was performed in conjunction with NRL using attenuated total reflection spectroscopy. ZnSe films showed considerably less OH(-) absorption than did the ThF4 films. Author (GRA)

N78-20500# United Technologies Research Center, East Hartford, Conn.
ASSESSMENT OF ADVANCED LASER MATERIALS PROCESSING TECHNOLOGY Final Report, 1 Mar. - 30 Sep. 1977
E. M. Breinan 30 Nov. 1977 115 p refs
(Contract N00014-77-C-0418)
(AD-A049312; UTRC/R77-912887-3) Avail: NTIS HC A06/MF A01 CSCL 11/6

Since the initial development of continuous high power CO2 lasers, there has been rapid progress in their application to materials processing. Within the past year the laser has strongly impacted the technology for controlled rapid solidification and solid state cooling of metals and alloys. The initial means for achieving rapid cooling was the LASERglaze(TM) process, which involves the melting of thin surface layers at high melting efficiencies so that they remain in intimate contact with the cold, solid substrate material, producing rapid solidification and cooling. Laser-glazing has produced a variety of novel, nonequilibrium structures generally characteristic of rapid cooling. Within the past few months, the LASERGLAZE concept has been evolved into a new process for production of rapidly cooled alloys in bulk form. This process was named LAYERGLAZE, since it involves the sequential deposition and 'glazing-into-place' of thin layers of material in order to build up a dense, bulk part with the structure and properties characteristic of rapidly-cooled alloys. Since the structure is consolidated in-situ, the problem of subsequent consolidation is absent. An important element of the LAYERGLAZE concept is the development of alloys with structures and properties which are ideally suited for specific applications. The alloy design approach has been termed phase decomposition strengthening (PDS). Initial concepts are aimed at improving material properties for aircraft gas turbine parts, and the potential for parts processed in this manner is being evaluated in depth. GRA

N78-20501# Naval Postgraduate School, Monterey, Calif.
NON-LINE-OF-SIGHT ELECTRO-OPTIC LASER COMMUNICATIONS IN THE MIDDLE ULTRAVIOLET M.S. Thesis
Dennis Mitchell Junge Dec. 1977 102 p refs
(AD-A050019; NPS61-77-001) Avail: NTIS HC A06/MF A01 CSCL 17/2

A Monte Carlo computer simulation was developed to model hypothesized electro-optic laser communication systems operating in the middle ultraviolet region of the spectrum called the solar blind. By assuming various source, propagation, and detector characteristics as well as certain performance parameters it is possible to predict the effective ranges and operating characteristics of such a system. Author (GRA)

N78-20502# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
KINETIC STUDY OF H PLUS HF (v EQUALS 3): KINETIC ISOTOPE EFFECT AND TEMPERATURE DEPENDENCE Interim Report
Jerry F. Bott and Raymond F. Heidner, III 27 Jan. 1978 36 p refs
(Contract F04701-77-C-0078)
(AD-A050192; TR-0078(3603)-1; SAMSO-TR-78-3423) Avail: NTIS HC A03/MF A01 CSCL 20/5

Rates of HF(v = 3) removal by H and D atoms were measured between 200 and 295 K in a laser-induced fluorescence-discharge flow-tube apparatus. The removal rates by H atoms were found to increase from 6.3 x 10 to the 13th power cu. cm/mol-sec at 295 K to 10 to the 14th power cu. cm/mol-sec at 200 K. The removal of HF(v = 3) by D atoms is somewhat slower, but the removal rates have a similar negative temperature dependence. There are several mechanisms by which H atoms can remove HF(v = 3), i.e., reaction to form H2F or deactivation to HF(v = 0, 1, or 2) with or without exchange of the F atom. The several possibilities are discussed and compared to theoretical calculations. Author (GRA)

N78-20503# California Univ., Livermore. Lawrence Livermore Lab.

USE OF X-RAY IMAGING ON LASER FUSION EXPERIMENTS

M. J. Boyle, D. T. Attwood, N. M. Ceglio, L. N. Koppel, V. W. Slivinsky, J. T. Larsen, E. K. Storm, R. H. Price, and H. G. Ahlstrom 19 Sep. 1977 26 p refs Presented at the 11th European Conf. on Laser Interaction with Matter, Oxford, UK, 19 Sep. 1977

(Contract W-7405-eng-48)

(UCRL-79817; Conf-770945-2) Avail: NTIS HC A03/MF A01

A variety of X-ray imaging techniques have been used to study the absorption, transport and implosion characteristics of exploding pusher microsphere targets irradiated with 1.06 microns light. Multichannel grazing incidence reflection microscopy, zone plate coded imaging and spatially resolved X-ray spectroscopy have observed the thermal and suprathermal X-ray emission associated with these phenomena. A second generation of X-ray imaging devices, designed for forthcoming high density implosion experiments, including axisymmetric x-ray microscopes and 1- and 2-D crystal line imaging devices, will also be briefly discussed. ERA

N78-20504# California Univ., Livermore. Lawrence Livermore Lab.

DIAGNOSTICS DEVELOPMENTS AND APPLICATIONS FOR LASER FUSION EXPERIMENTS

Lamar W. Coleman 2 Sep. 1977 23 p refs Presented at 11th European Conf. on Laser Interaction with Matter, Oxford, 19-23 Sep. 1977

(Contract W-7405-eng-48)

(UCRL-79793; Conf-770945-1) Avail: NTIS HC A02/MF A01

Diagnostics techniques applied to current laser fusion target experiments discussed include holographic interferometry of target plasmas, coded aperture imaging of thermonuclear alpha-particles, and neutron energy spectrum measurements. ERA

N78-20505# California Univ., Berkeley. Lawrence Berkeley Lab.

LASER VELOCIMETER WITH HIGH SPATIAL RESOLUTION

Calvin Tom Chew Sep. 1976 146 p refs

(Contract W-7405-eng-48)

(LBL-5725) Avail: NTIS HC A07/MF A01

Aspects to be considered in the design of a laser Doppler velocimeter were studied in detail. These aspects were applied to the construction of a velocimeter capable of high spatial resolution and accurate scanning. Moreover the device operates interchangeably both in the reference and differential modes, thus giving the three velocity, components at any selected point of measurement. Experiments were performed with the velocimeter to test its reliability in velocity measurements. These tests were carried out using a rotating disk and scaled down flow channel. ERA

N78-20506# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

CO2 LASER INDUCED ISOMERIZATION OF METHYLISOCYANIDE [CO2-LASERINDUZIERTE ISOMERISIERUNG VON METHYLISOCYANID]

C. Kleinermanns and H. G. Wagner Jul. 1977 58 p refs In GERMAN

(MPIS-27/1976) Avail: NTIS HC A04/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 10,80

The isomerization of CH3 NC to yield CH3 CN at pressure less than 1 Torr was investigated using a reaction-cell-in-resonator technique and CW and pulsed CO2 lasers. No isomerization could be detected for continuous laser irradiation. An upper limit of allowed vibrational-translational relaxation velocity constants was estimated as being about a factor 3 below the measured velocity constant. Methylisocyanide isomerizates selectively to acetonitrite when irradiated by a pulsed CO2 laser with long-focus focusing. For short-focus focusing, dissociation products occur, the luminescence of which was observed and spectrally split. The dissociation proceeds under collisionless conditions and thus can not be attributed to thermal heating. ESA

N78-21043# Joint Publications Research Service, Arlington, Va.

NEW LASER MICROSCOPE DESCRIBED

M. Kazaryan *In its* Transl. on USSR Sci. and Technol. (JPRS-70873) 31 Mar. 1978 p 40-41 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), no. 14 (15990), 17 Jan. 1978 p 4

(For availability see N78-21041 11-99)

Copyright. Avail: Issuing Activity

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N78-20507 Auburn Univ., Ala.

OPTIMIZATION OF CREEPING GAITS FOR QUADRUPED LEVERED VEHICLES Ph.D. Thesis

Zia ur Rahman 1977 137 p

Avail: Univ. Microfilms Order No. 7730437

A combinatorial analysis of the six quadruped creeping gaits was carried out. The most stable gait turns out to be a 1423. The only statically unstable gait was 1324. Gaits 1432 and 1234 turn out to be stable if feet were allowed to cross. It was found that the longitudinal stability does not give a true measure of stability. It was hence redefined in terms of the perpendicular distances from the center of gravity locus to the sides of the support polygon and was called the general stability or just stability. The optimization problem now involves nonlinear functions. A preliminary maximization was done with respect to gamma's and sigma 5. The resulting solution was used as the first approximation for the gradient method of nonlinear programming. Dissert. Abstr.

N78-20508 Oklahoma State Univ., Stillwater.

DYNAMIC ANALYSIS OF SPATIAL MECHANISMS USING THE METHOD OF DUAL SUCCESSIVE SCREWS Ph.D. Thesis

In-Ping J. Lee 1977 210 p

Avail: Univ. Microfilms Order No. 7801283

An intensive literature search on the dynamics of mechanisms is reported. A successive screw method has been developed to conduct the dynamic analysis of spatial mechanisms. Procedures to unfold the mechanism are discussed. To locate a point in a rigid body is presented. Numerical examples illustrating the kinematic analysis of the RCSR RCSR-CSR and RCHCH spatial mechanisms are given. Equations of motion are formulated by using the d'Alembert principle. The constraint equation of each kinematic pair is formed based on its kinematic property. Kinetostatics and dynamic response are illustrated by using spatial RCSR, RCSR-CSR and RCHCH mechanisms as examples. Dynamic analysis of 7R, RRRRRH, RRRRHC, PPHCHP, RCRCR, PHCHC spatial mechanisms are also presented. Dissert. Abstr.

N78-20509 Virginia Univ., Charlottesville.

A FINITE ELEMENT DYNAMIC ANALYSIS OF PRESSURE DAM AND TILTING PAD BEARINGS Ph.D. Thesis

John Charles Nicholas 1977 256 p

Avail: Univ. Microfilms Order No. 7800439

Step bearings introduce a hydrodynamically generated load which is often used to improve the stability of rotating equipment.

A finite element approach for infintely long step bearings is developed that takes into account turbulent and inertia effects. The turbulent-inertia case is compared to pure laminar theory and linearized turbulent theory to determine regions of applicability for the simpler theories. Results indicate that finite length step bearings with oil lubricants can be analyzed using linearized turbulent theory without taking into account the pressure drop at the step due to inertia. The finite pressure dam bearing is analyzed. Stiffness and damping coefficients are presented for the 5 pad tilt pad bearing for various preloads, offsets, length to diameter ratios and pad loadings. A stability analysis is carried out for an 11 stage centrifugal compressor. Dissert. Abstr.

N78-20510 Columbia Univ., New York.
EXPERIMENTAL INVESTIGATION OF GAS BEARINGS WITH ULTRA-THIN FILMS Ph.D. Thesis
Aron Sereny 1977 123 p
Avail: Univ. Microfilms Order No. 7802344

Bearing clearances were accurately measured on the order of 10 microinches in self acting, pivoted, narrow-slider gas bearings. The experimental measurements were based on light interferometry using a variable wavelength pulsed dye laser and a CW HeNE laser as monochromatic sources. The light interference in the gas bearing was obtained by flying the slider on a very precise, optically flat quartz disk through which the light beam was transmitted. The experimentally measured bearing clearances were compared quantitatively with rather accurate theoretical predictions obtained by numerical solution of Reynolds differential equation for compressible fluids with slip boundary conditions. The results indicate that as clearances in narrow gas bearings get progressively smaller, while the Knudsen number increases to values beyond 0.1, the theoretical model fails to predict the bearing behavior. It is also argued that this failure is because of the weakness of the continuum model. Dissert. Abstr.

N78-20511*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL PROPERTIES OF SURFACES
Donald H. Buckley 1978 25 p refs Presented at the Intern. Conf. on Met. Coatings, San Francisco, 3-7 Apr. 1978; sponsored by Am. Vacuum Soc.
(NASA-TM-73896) Avail: NTIS HC A02/MF A01 CSCL 20K

The real area of contact between two solid surfaces is only a small portion of the apparent area. Deformation of these areas can result in solid state contact through surface films. For clean solid to solid contact strong adhesive bonding occurs across the interface. Under these conditions many properties of the solid such as the metallurgical and chemical nature of metals can influence adhesion, friction, and wear behavior. The presence of gases, liquids, and solid films on the surface of solids alter markedly tribological characteristics. These surface films can also considerably change the mechanical effects of solid state contact on bulk material behavior. Author

N78-20512*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF SELECTED METALS AND ALLOYS IN SLIDING CONTACT WITH AISI 440 C STAINLESS STEEL IN LIQUID METHANE AND IN LIQUID NATURAL GAS
Donald W. Wisander Feb. 1978 18 p refs
(NASA-TP-1150; E-9195) Avail: NTIS HC A02/MF A01 CSCL 20K

Aluminum, titanium, beryllium, nickel, iron, copper, and several copper alloys were run in sliding contact with AISI 440C in liquid methane and natural gas. All of the metals run except copper and the copper alloys of tin and tin-lead showed severely galled wear scars. Friction coefficients varied from 0.2 to 1.0, the lowest being for copper, copper-17 wt. % tin, and copper-8 wt. % tin-22 wt. % lead. The wear rate for copper was two orders of magnitude lower than that of the other metals run. An additional order of magnitude of wear reduction was achieved by the addition of tin and/or lead to copper. Author

N78-20513*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREDICTED AND EXPERIMENTAL PERFORMANCE OF JET-LUBRICATED 120-MILLIMETER-BORE BALL BEARINGS OPERATING TO 2.5 MILLION DN
Harold H. Coe and Erwin V. Zaretsky Apr. 1978 28 p refs
(NASA-TP-1196; E-9288) Avail: NTIS HC A03/MF A01 CSCL 13I

Bearing inner- and outer-race temperatures and friction power losses were calculated using two computer programs. The values obtained were compared with previously reported experimental data for 120 mm bore bearings which operated at thrust loads to 22 240 N (5000 lb), shaft speeds to 20 800 rpm, and with two lubricant flow rates. One program severely underestimated the power loss, while the other, called SHABERTH, provided a good prediction of both race temperatures and power losses. Author

N78-20514*# Mechanical Technology, Inc., Latham, N. Y.
BALANCING TECHNIQUES FOR HIGH-SPEED FLEXIBLE ROTORS Final Report
A. J. Smalley Apr. 1978 129 p refs
(Contract NAS3-18520)
(NASA-CR-2975; MTI-77TR2) Avail: NTIS HC A07/MF A01 CSCL 13I

Ideal and non-ideal conditions for multiplane balancing are addressed. Methodology and procedures for identifying optimum balancing configurations and for assessing, quantitatively, the penalties associated with non-optimum configurations were developed and demonstrated. The problems introduced when vibration sensors are supported on flexible mounts were assessed experimentally, and the effects of flexural asymmetry in the rotor on balancing were investigated. A general purpose method for predicting the threshold of instability of an asymmetric rotor was developed, and its predictions are compared with measurements under different degrees of asymmetry. Author

N78-20515# Pennsylvania State Univ., University Park. Applied Research Lab.
COMPUTER-ASSISTED DESIGN OF PUMP IMPELLERS
M. C. Brophy 5 Jan. 1978 103 p refs
(Contract N00017-73-C-1418)
(AD-A050187; TM-78-02) Avail: NTIS HC A06/MF A01 CSCL 13/10

A computer program was written to aid the engineer in the design of pump impellers. The design process first considers the one-dimensional analysis and then proceeds to the two- and three-dimensional construction of the impeller blading that will enable the pump to meet the design operating condition. The program incorporates the Streamline Curvature Method to determine the axisymmetric flow through the pump and employs techniques which are similar to the Mean Streamline Method of blade design. Computer generated plots of the various impeller views are included, and a completed design ready for fabrication is produced. The designer is encouraged at many points within the program to modify the design method as required by his individual needs or desires. A sample design is presented for a pump which is to be used as a model for a high-speed, marine surface craft, propulsion unit. Author (GRA)

N78-20516# Naval Postgraduate School, Monterey, Calif.
COMBUSTION GAS GENERATOR FOR GAS TURBINE EXHAUST SYSTEMS MODELING M.S. Thesis
Paul Davidson Ross, Jr. Dec. 1977 112 p refs
(AD-A049924; NPS69-77-0005) Avail: NTIS HC A06/MF A01 CSCL 21/5

A combustion gas generator was constructed for the purpose of modeling shipboard gas turbine engine exhaust systems. In particular, the system was designed and validated for exhaust stack temperatures varying from 700 to 900 F with an exhaust stack inside diameter of 7.122 inches. Additionally a proposed gas turbine exhaust four-nozzle eductor system was constructed for testing under high temperature conditions to verify temperature correlation parameters developed using cool air as the primary flow medium. A secondary air flow metering box was designed and partially completed for the determination of eductor pumping characteristics during hot flow operations. Author (GRA)

N78-20517# California Univ., Livermore. Lawrence Livermore Lab.
OVERVIEW OF ADVANCED PROCESS CONTROL IN WELDING WITHIN ERDA

R. E. Armstrong 11 Feb. 1977 14 p refs Presented at the SME Conf., Los Angeles, 15 Mar. 1977
(Contract W-7405-eng-48)
(UCRL-79170; Conf-770334-1) Avail: NTIS HC A02/MF A01

The special kinds of demands placed in ERDA weapons and reactors require very reliable welds. Process control is critical in achieving this reliability. ERDA has a number of advanced process control projects underway with much of the emphasis being on electron beam welding. These include projects on voltage measurement, beam-current control, beam focusing, beam spot tracking, spike suppression, and computer control. A general discussion of process control in welding is followed by specific examples of some of the advanced joining process control projects in ERDA. ERA

N78-20518# Westinghouse Electric Corp., Lester, Pa. Generation Systems Div.
HIGH TEMPERATURE TURBINE TECHNOLOGY PROGRAM. PHASE 1: PROGRAM AND SYSTEM DEFINITION. TOPICAL REPORT: FUELS CLEANUP AND TURBINE TOLERANCE
Feb. 1977 284 p refs
(Contract EX-76-C-01-2290)
(FE-2290-27) Avail: NTIS HC A13/MF A01

There is insufficient deposition data to establish the level and size of particulates that the turbine can ingest and be assured of satisfactory electric utility operations. A review of gasification systems, including hot and cold gas cleanup was made, to examine the alternatives available and compare the various systems. The cold gas cleanup system was more effective in removing ammonia and alkali metals. The OPDD system was found to meet the present-day steam power plant emissions regulations and very nearly meet the advanced target regulations. The cold gas cleanup system produced results within the turbine tolerance range for corrosion and erosion. The turbine tolerance for deposition must be determined with carefully planned experimental programs. ERA

N78-20519# Ernst-Mach-Inst., Freiburg (West Germany).
THE IMPACT FLASH. AN INDICATOR FOR PROCESSES IN HYPERVELOCITY COLLISIONS
G. Goetting 1977 78 p refs In GERMAN; ENGLISH summary
(Rept-2/77) Avail: NTIS HC A05/MF A01

The flash which appears during hypervelocity impact was studied. Time-resolved spectra show that the flash originates from evaporated and partly ionized projectile and target material, which escapes at high velocities at the beginning of the penetration process. The moment of the beginning of the flash was measured and calculated from the shock waves which are produced by the collision of the projectile. Origin and propagation of the vapor cloud are discussed by means of a model, and the time dependence of the impact flash intensity is explained. Author (ESA)

N78-20520# Southwest Research Inst., San Antonio, Tex.
DIESEL CRANKCASE EMISSIONS CHARACTERIZATION, TASK 4 Final Report
Charles T. Hare and Daniel A. Montalvo Sep. 1977 165 p refs
(Contract EPA-68-03-2196)
(PB-275950/4; SwRI-AR-1189; EPA-460/3-77-016) Avail: NTIS HC A08/MF A01 CSCL 07D

Crankcase or blowby emissions from two inservice diesel engines, developing and demonstrating methodology for analyses where none existed were characterized. Gaseous emissions measured included: emission mass rate; HC, CO, CO2, and NOx (both exhaust and crankcase emissions); individual hydrocarbons; aldehydes; and N-dimethylnitrosamine. Crankcase particulate measurements included: mass rate; concentration; size distribution; elemental composition; sulfate; total solubles; BaP in solubles; boiling range of solubles; and N-dimethylnitrosamine. These measurements were made using variations of the standard 13-mode diesel procedure. GRA

N78-20521# Pennsylvania Transportation Inst., University Park.
RELATIONSHIP OF LOCKED WHEEL FRICTION TO THAT OF OTHER TEST MODES Final Report
V. R. Shah and J. J. Henry Mar. 1977 98 p refs Sponsored jointly by Federal Highway Admin. and Pa. Dept. of Transportation
(PB-275378/8; PTI-7703; FHWA-PA-72-7) Avail: NTIS HC A05/MF A01 CSCL 13B

The concept of using the reduced brake slip number plot (BSN vs. sliding velocity) is introduced and it is shown that it can be used to determine skid number gradient (SNG) from a test conducted at only one vehicle speed. The use of side force and slip testing for the evaluation of longitudinally grooved concrete pavements is investigated with blank and ribbed tires. Measurements with a blank tire indicate a substantial improvement due to grooving while measurements with a ribbed tire are not sensitive to the effects of longitudinal pavement grooves. An analytical model for predicting side force from locked wheel or slip testing is developed and it is applied to the six pavements on which testing was performed. GRA

N78-20522# Calspan Corp., Buffalo, N. Y.
EFFECT OF TIRE WEAR ON SKID RESISTANCE Final Report, Oct. 1976 - Jun. 1977
G. A. Gusakov, G. A. Tapia, and L. Bogdan Jul. 1977 44 p refs Sponsored by FHWA
(PB-275334/1; CALSPAN-ZM-6043-T-1; FHWA/RD-77-105)
Avail: NTIS HC A03/MF A01 CSCL 13F

The braking traction coefficients of ASTM E501 tires were measured as a function of tread depth, velocity and water film thickness. Data were collected using shaved and used tires in the slip ratio range from 0 to -1. At constant speed, braking traction coefficients for shaved tires linearly decreased with decreasing tread depth with the rate of loss of thickness. Test results for the used tires did not correlate with those for the shaved tires. Braking traction coefficients for the former exhibited no consistent sensitivity to tread depth at constant speed. GRA

N78-20523# Southampton Univ. (England). Inst. of Sound and Vibration Research.
RATE OF HEAT RELEASE IN DIESEL ENGINES Final Report, May - Oct. 1976
David Anderton Oct. 1977 147 p refs
(Contract DOT-TSC-1101)
(PB-275421/6; DOT-TSC-OST-77-56) Avail: NTIS HC A07/MF A01 CSCL 21G

The concept of heat release in diesel engines was compared with reaction rates in petrol engines as a means of describing combustion. The intimate relationships between heat release, cylinder pressure development and cylinder pressure spectra are illustrated. A combustion model for the prediction of heat release and combustion noise, based primarily on physical aspects of diesel combustion system design, is put forward. This model indicates that fuel droplet size and the temperature of the cylinder contents are of prime importance in determining cylinder pressure noise excitation. The relationship between cylinder pressure spectra and combustion induced engine noise is described and used to show how the combustion model can predict combustion induced noise at the design stage. GRA

N78-20359# Gulf and Western Advanced Development and Engineering Center, Swarthmore, Pa.
BALANCING OF LINKAGES
R. S. Berkof, G. G. Lowen (City Coll. of The City Univ. of New York), and F. R. Tepper (Picatinny Arsenal) *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 6 Jun. 1977 p 3-10 refs (For availability see N78-20358 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375 CSCL 20K

N78-20367# Digital Equipment Corp., Maynard, Mass.
THE FINITE ELEMENT APPLIED TO THE ANALYSIS OF MECHANISMS AND MACHINES
R. C. Winfrey *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 12 Dec. 1977 p 27-33 refs (For availability see N78-20365 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N78-20524# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
ESTIMATING TIMES TO EARLY FAILURES USING FINITE DATA TO ESTIMATE THE WEIBULL SCALE PARAMETER Final Report, Sep. 1976 - Mar. 1977
Robert L. Neulieb Sep. 1977 22 p refs
(AD-A050263; AFFDL-TR-77-89) Avail: NTIS HC A02/MF A01 CSCL 14/4

Parameters for a Weibull distribution of times to failure must be estimated from a finite set of test points. Much effort has been expended identifying the shape parameter for different materials. This report investigates determining probabilities of early failures when estimating the scale parameter from a finite number of tests. Author (GRA)

N78-20525# Martin Marietta Aerospace, Orlando, Fla.
FAILURE RATE MATHEMATICAL MODELS FOR DISCRETE SEMICONDUCTORS Final Technical Report, Jul. 1976 - Nov. 1977
Thomas W. Butler, Donald F. Cottrell, and William M. Maynard Jan. 1978 129 p refs
(Contract F30602-76-C-0337)
(AD-A050181; OR-14911; RADC-TR-78-3) Avail: NTIS HC A07/MF A01 CSCL 09/1

This study revises and updates the appropriate sections of Military Handbook 217B, 'Reliability Prediction of Electronic Equipment,' pertaining to semi-conductor devices, section 2.2. More than 200 billion part-hours of field operating data were collected and analyzed during the study effort. Significant revisions were made to environmental factors and some quality factors. Author (GRA)

N78-20526# Missouri Univ., Columbia. Dept. of Statistics.
TWO SIDED CONFIDENCE INTERVALS FOR AN EXPONENTIAL PARAMETER FROM A LIFE TEST WITH TYPE 1 AND TYPE 2 CENSORING
Kenneth B. Fairbanks Jan. 1978 36 p refs
(Contract N00014-76-C-0789)
(AD-A050197; TR-73) Avail: NTIS HC A03/MF A01 CSCL 14/4

A life test on items assumed to have an exponential lifetime is often designed with type I censoring, type II censoring or both. In type I censoring, n items are placed on test and observed for a fixed time t^*, while in type II censoring the test terminates with the rth failure, where r is a preassigned integer. If these schemes are combined, the test terminates at min(t^*, tau sub r) where Tau sub r is the time of the rth failure. Procedures for estimating the exponential parameter from this combined scheme were first considered by Epstein. Epstein established one sided confidence intervals for this parameter. This report reviews Epstein's work and establishes two sided confidence intervals. The confidence intervals are expressed in terms of time on test and chi-square percentiles with the degrees of freedom depending on the number of observed failures. An expression for the expected length of the confidence intervals is also derived. Author (GRA)

N78-20527# Florida State Univ., Tallahassee. Dept. of Statistics.
MULTISTATE COHERENT SYSTEMS Interim Report
E. El-Neweihi, F. Proschan, and J. Sethuraman Oct. 1977 24 p refs
(Grant AF-AFOSR-2581-74)
(AD-A049994; FSU-STATISTICS-M434; AFOSR-78-0046TR; ARO-13888.12-MX) Avail: NTIS HC A02/MF A01 CSCL 14/4

The vast majority of reliability analyses assume that components and system are in either of two states: functioning or failed. The present paper develops basic theory for the study of systems of components in which any of a finite number of states may occur, representing at one extreme perfect functioning and at the other extreme complete failure. Axioms are given extending the standard notion of a coherent system to the new notion of a multistate coherent system. For such systems, deterministic and probabilistic properties are obtained for system performance which are analogous to well known results for coherent system reliability. GRA

N78-20528# TRW, Inc., Cleveland, Ohio. Materials Technology.
IMPROVED ULTRASONIC INSPECTION OF TITANIUM ALLOY FORGING BILLETS Final Report, 15 Jul. 1971 - 30 Jul. 1976
I. M. Matay Jul. 1977 292 p refs
(Contract F33615-71-C-1712)
(AD-A049682; TRW-ER-7554; AFML-TR-77-111) Avail: NTIS HC A13/MF A01 CSCL 11/6

Titanium is an important raw material in both aircraft engines and structures. It is also being used in a larger-and-larger size forged billet form. The billets' increasing size, in addition to their coarser-grained structures, drastically limit the detection capabilities and reliability of finding small defects when using established ultrasonic techniques along with manually operated commercial instruments. Providing an improved billet inspection to insure greater reliability in the finished part at an improved overall process economy is desirable. Available commercial instruments were evaluated and proven incapable of meeting the critical inspection requirements. An original design for the ultrasonic circuitry, interfaced with a minicomputer, and a data display system which shows the billet in multiple cross-section slices was fabricated. All the detectable defects and/or only those which meet or exceed a selected quality control reject criteria, can be displayed. An Ultrasonic Diagnostic Inspection System, UDIS, capable of increased inspection sensitivity, resolution and speed with reduced equipment and operator variability was built and evaluated in this program. The performance characteristics of the system have been well defined by laboratory operations and the feasibility of its application to mill inspection of up to 16-inches diameter and 10-foot length billets has been demonstrated by limited in-plant field trials. In addition, a joint industry (billet maker/user) team evaluation of the UDIS has also been carried out for the establishment of an improved billet inspection specification. The report also covers recommendations for industry utilization of the UDIS. GRA

N78-20529# Stanford Univ., Calif.
A HAZARDOUS INSPECTION MODEL
David A. Butler 21 Oct. 1977 33 p refs
(Contract N00014-75-C-0561)
(AD-A049478; SU-TR-187) Avail: NTIS HC A03/MF A01 CSCL 14/4

This paper considers a hazardous inspection model. One is given a device which operates throughout a number of periods and which in each period may be subject to failure. Failure of the device is directly observable. Prior to failure the device will enter a state in which it is functioning, but in an impaired manner. This state can be detected only by performing an inspection. Once the machine is known to be in the impaired state, appropriate action may be taken to prolong the remaining life of the device. In this respect inspection is valuable. However, the act of inspecting the device when it is not impaired may, itself, cause the device to become impaired. In this respect inspection is hazardous. This paper deals with the determination of inspection policies which maximize the expected lifetime of the device. GRA

N78-20530# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
EVALUATION OF ELECTROMAGNETIC-ACOUSTIC CONCEPTS OF INSPECTION OF STEAM GENERATOR TUBING Final Report
C. F. Vasile and R. B. Thompson Aug. 1977 81 p refs
(EPRI-NP-519) Avail: NTIS HC A05/MF A01

The objective of this project was to evaluate the feasibility of using the electromagnetic-acoustic transducer concept for steam generator tube inspection. Results obtained from a laboratory-proof-of-principle demonstration show that this technique is a feasible approach for both steam generator and boiler tube inspections. This report describes the approach and materials used in the experimental work and compares the results with

those developed from theoretical considerations. On the basis of this work, a recommendation is made to proceed with development of a prototype system for field evaluation. ERA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N78-20531 California Univ., Berkeley.
AN IMPROVED METHOD FOR FRACTURE TOUGHNESS EVALUATION IN THE LINEAR ELASTIC RANGE AND A COMPARISON WITH ELASTIC-PLASTIC DATA OBTAINED WITH SMALLER SPECIMENS Ph.D. Thesis
Vimal Kumar Pujari 1977 143 p
Avail: Univ. Microfilms Order No. 7731507

The design and development of a new machine for controlled crack propagation and plane strain fracture toughness measurements in metallic materials was presented. This differs from previous methods in that the point of load application moves with the advancing crack front through the specimen. The new machine has higher load capacity, requires specimens with a much simpler geometry, provides any combination of interference displacement desired any time during the test, and plots opening mode force versus crack length relationship directly. To study the various aspects of the testing machine, 7075 aluminum alloy was used throughout the experimentation because its fracture toughness properties are well understood in the linear elastic-range and are available in considerable amount in the literature. Dissert. Abstr.

N78-20532 Cornell Univ., Ithaca, N. Y.
PROBABILISTIC MODELS FOR THE TENSILE STRENGTH OF COMPOSITE MATERIALS Ph.D. Thesis
David Gary Harlow 1977 118 p
Avail: Univ. Microfilms Order No. 78-01627

The class of composites considered consists of a low stiffness matrix reinforced with high strength and high stiffness fibers aligned in parallel. The question of prime importance for these mechanical systems was how to relate single fiber properties to those for the more complex composite structure with respect to predicting the tensile strength. A solution to this problem was obtained by deriving either an exact or an asymptotic probability distribution function for the tensile strength of a composite. Each new contribution models a single section with a failure mechanism which differs from that generated by the common assumption of equal load sharing among surviving fibers. The models presented capture the nearest neighbor effects which result from a fiber failure. Dissert. Abstr.

N78-20533 Cornell Univ., Ithaca, N. Y.
CREEP BENDING OF BEAMS AND PLATES USING A STATE-VARIABLE APPROACH Ph.D. Thesis
Yen Chung Waung 1977 99 p
Avail: Univ. Microfilms Order No. 78-02070

The theory of creep bending of beams is formulated in terms of Hart's state-variable constitutive equations. The bending of rectangular beams under constant and variable moments is solved by a numerical routine. The stationary creep of a beam in pure bending is obtained in closed form. The influence upon creep deformation of the state variable called hardness is demonstrated. The theory of creep bending of circular plates under axisymmetric lateral loads is formulated and applied to plates with simply supported and clamped edges through a standard algorithm. An approximate theory is deduced by assuming that hardness and thus moment hardness remain constant while a structure is undergoing creep deformation. Dissert. Abstr.

N78-20534*# Kansas Univ. Center for Research, Inc., Lawrence.
EXPERIMENTAL AND FINITE ELEMENT INVESTIGATION OF THE BUCKLING CHARACTERISTICS OF A BEADED SKIN PANEL FOR A HYPERSONIC AIRCRAFT Ph.D. Thesis. Final Report
William H. Siegel Apr. 1978 139 p refs
(Grant NsG-4006)
(NASA-CR-144863) Avail: NTIS HC A07/MF A01 CSCL 20K

As part of NASA's continuing research into hypersonics and 85 square foot hypersonic wing test section of a proposed hypersonic research airplane was laboratory tested. The project reported on in this paper has carried the hypersonic wing test structure project one step further by testing a single beaded panel to failure. The primary interest was focused upon the buckling characteristics of the panel under pure compression with boundary conditions similar to those found in a wing mounted condition. Three primary phases of analysis are included in the report. These phases include: experimental testing of the beaded panel to failure; finite element structural analysis of the beaded panel with the computer program NASTRAN; a summary of the semiclassical buckling equations for the beaded panel under purely compressive loads. Comparisons between each of the analysis methods are also included. Author

N78-20535*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPUTER PROGRAM FOR DETERMINING MASS PROPERTIES OF A RIGID STRUCTURE
Reid A. Hull, John L. Gilbert, and Phillip J. Klich Mar. 1978 47 p refs
(NASA-TM-78681) Avail: NTIS HC A03/MF A01 CSCL 20K

A computer program was developed for the rapid computation of the mass properties of complex structural systems. The program uses rigid body analyses and permits differences in structural material throughout the total system. It is based on the premise that complex systems can be adequately described by a combination of basic elemental shapes. Simple geometric data describing size and location of each element and the respective material density or weight of each element were the only required input data. From this minimum input, the program yields system weight, center of gravity, moments of inertia and products of inertia with respect to mutually perpendicular axes through the system center of gravity. The program also yields mass properties of the individual shapes relative to component axes. Author

N78-20536*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GAUSSIAN STEP-PRESSURE LOADING OF RIGID VISCO-PLASTIC PLATES Ph.D. Thesis
Robert J. Hayduk and Barbara J. Durling Mar. 1978 28 p refs
(NASA-TP-1123; L-11885) Avail: NTIS HC A03/MF A01 CSCL 20K

The response of a thin, rigid viscoplastic plate subjected to a spatially axisymmetric Gaussian step pressure impulse loading was studied analytically. A Gaussian pressure distribution in excess of the collapse load was applied to the plate, held constant for a length of time, and then suddenly removed. The plate deforms with monotonically increasing deflections until the dynamic energy is completely dissipated in plastic work. The simply supported plate of uniform thickness obeys the von Mises yield criterion and a generalized constitutive equation for rigid viscoplastic materials. For the small deflection bending response of the plate, the governing system of equations is essentially nonlinear. Transverse shear stress is neglected in the yield condition and rotary inertia in the equations of dynamic equilibrium. A proportional loading technique, known to give excellent approximations of the exact solution for the uniform load case, was used to linearize the problem and to obtain the analytical solutions in the form of eigenvalue expansions. The effects of load concentration, of an order of magnitude change in the viscosity of the plate material, and of load duration were examined while holding the total impulse constant. Author

N78-20537# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
ON ISOCHORIC FINITE ELEMENTS
John H. Argyris and Padraic Cathal Dunne Jul. 1977 59 p refs
(ISD-230) Avail: NTIS HC A04/MF A01

The use of constant strain finite elements for incompressible applications was studied. The applicability of the

improved finite elements, TRIM3, TET4, and TRIAX3, in the incompressible regime was investigated. For individual titles, see N78-20538 through N78-20539.

N78-20538 Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

CONSTANT STRAIN FINITE ELEMENTS FOR ISOCHORIC STRAIN FIELDS

In its On Isochoric Finite Elem. Jul. 1977 36 p refs Presented at the 3rd Intern. Symp. on Computing Methods in Appl. Sci. and Eng., Versailles, France, 5-9 Dec. 1977 (For availability see N78-20537 11-39)

Avail: NTIS HC A04/MF A01

A new procedure for the use of constant strain simplex elements for incompressible applications was developed. The mechanical representation of the TRIM-3 element is discussed, and the modified elements TET4 and TRIAX3 are dealt with. Formation of equilibrium and constraint equations is discussed, and solutions of the incompressible system, for a fixed boundary and for a free or partly free boundary, are given. Following a discussion on the freedom/constraint ratio a solution of the compressible system is given. Extensions of the method to large strains, including the special case of Mooney material, the nearly incompressible large strain case, and incompressible membranes with large strain, are presented. ESA

N78-20539 Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

IMPROVED DISPLACEMENT FINITE ELEMENTS FOR INCOMPRESSIBLE MATERIALS

In its On Isochoric Finite Elem. Jul. 1977 21 p refs (For availability see N78-20537 11-39)

Avail: NTIS HC A04/MF A01

The use of the simplex constant strain finite elements TRIM3 and TET4 and the axisymmetric element TRIAX3 in the incompressible regime, where the unmodified elements are unsuitable except for TRIM3 where a special crossed diagonal arrangement is suitable for small strain applications, is discussed. Partition of the strain energy density was studied and the dilatational potential energy was calculated. Equilibrium and constant strain equations for the incompressible case and for the compressible case were derived. Numerical examples for a symmetrically loaded equilateral triangle (TRIM3 and TET4), a deep cantilever beam, a built-in incompressible membrane with end loading, and torsion of a triangular bar are given. ESA

N78-20540# Brown Univ., Providence, R. I. Div. of Engineering.

LARGE VISCOPLASTIC DEFLECTIONS OF IMPULSIVELY LOADED PLANE FRAMES

Paul S. Symonds and Choon T. Chon Sep. 1977 46 p refs (Contracts N00014-75-C-0860; Grant NSF ENG-74-21258)

(AD-A049867; N00014-0860/3) Avail: NTIS HC A03/MF A01 CSCL 13/13

Applications are described of two estimation techniques to obtain final deflections and response times of plane rectangular frames subjected to impulsive loading on the transverse (beam) member. Deflections up to roughly one third the span (thirty thicknesses) are estimated by the mode approximation and deflection bounds techniques, treating the plastic rate dependence by means of homogeneous viscous constitutive equations. Comparisons are made with recent test results, and the degree of agreement is discussed in terms of the known error sources of the two techniques. Author (GRA)

N78-20541# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.

TOPICS IN LOCAL BIFURCATION THEORY Interim Report

Jack K. Hale 30 Nov. 1977 11 p refs Presented at the New York Acad. of Sci. Conf. on Bifurcation Theory and Appl., 31 Oct. - 4 Nov. 1977

(Grants AF-AFOSR-3092-76; AROD-AAG-29-76-G-0294; NSF MCS-76-07247)

(AD-A050253; AFOSR-78-0136TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

It was shown that systematical determination of the bifurcation surfaces can be accomplished by elementary scaling techniques and the implicit function theorem. A summary was given of these results for the case of bifurcation near an isolated solution of families of solutions of the equation M(lambda sub 0, x) = 0. The results were applied to the buckling theory of plates and shells under the effect of external forces, imperfections, curvature, and variations in shape. The results on bifurcation near families were applied to nonlinear oscillations and the theory of homoclinic orbits. Author (GRA)

N78-20542# Syracuse Univ., N. Y. George Sachs Fracture and Fatigue Research Lab.

FRACTURE TOUGHNESSES OF THIN AND TOUGH PLATES

H. W. Liu and Albert S. Kuo Aug. 1977 23 p refs

(Grant DAAG29-76-G-0290)

(AD-A049708; TR-HWL-1611-877; ARO-11961.6-E) Avail: NTIS HC A02/MF A01 CSCL 11/6

Wells has proposed using crack tip opening displacement as a measure of the fracture toughness of cracked plates in general yielding. The concept is applicable to thin plates loaded to extensive plastic deformation. The method is used to determine the fracture toughnesses of HY-80 steel plates. Author (GRA)

N78-20543# New Mexico Univ., Albuquerque. Civil Engineering Research Facility.

POLLYANNA: A THREE DIMENSIONAL STRUCTURE/MEDIA INTERACTION COMPUTER PROGRAM Final Report

Billy Joe Thorne and Jerry W. Berglund Kirtland AFB, N. Mex. AFWL Jan. 1978 229 p refs

(Contract F29601-76-C-0015)

(AD-A050338; CERF-SSR-12; AFWL-TR-77-12) Avail: NTIS HC A11/MF A01 CSCL 20/11

The Pollyanna Program calculates the response of three-dimensional structures embedded in continuous media with which they interact. A simplex (tetrahedral) element is used and solved by lumped force, lumped mass assumptions. A very large number of degrees-of-freedom can be solved with the CDC 6600 computer extended-core, random-access storage or the CDC 7600 large core memory. Structural walls are modeled by lumped node lines through the thickness of the wall. Coupling between media and structure is accomplished by a matched node pair interface model which assumes a small relative displacement of the matched nodes. Material response is assumed to be either elastic or piecewise linear elastic/plastic with hysteresis. Solution speeds vary from 100 microseconds per element time step for an elastic material on the CDC 7600 to about 500 microseconds per element time step for a hysteretic soil material on the CDC 6600. Author (GRA)

N78-20544# California Univ., Los Angeles. Dept. of Materials.

STRESS CONCENTRATION DUE TO AN OBLATE SPHEROIDAL INCLUSION

Mamoru Shibata and Kanji Ono Dec. 1977 27 p refs

(Contract N00014-75-C-0889)

(AD-A049678; TR-5) Avail: NTIS HC A03/MF A01 CSCL 20/11

The stress concentration of an oblate spheroidal inclusion parallel to the stress and deformation axis is obtained by using Eshelby theory. This is complementary to our previous study, in which stress concentration is analyzed for an oblate spheroidal inclusion normal to the stress and deformation axis. Effects of the elastic stiffness and the aspect ratio of the inclusion on the stress concentration are examined in detail. The internal stresses inside the inclusion and at the matrix-inclusion boundary are calculated considering inhomogeneity and plastic deformation effects. Stress concentrations at graphite flakes and nodules in cast iron are discussed. Author (GRA)

N78-20545# Naval Surface Weapons Center, White Oak, Md.

JUNCTION INPUT GENERATOR (JIG), A NASTRAN PRE-PROCESSOR THEORETICAL DEVELOPMENT, USER'S MANUAL AND PROGRAM LISTING Progress Report, Jul. 1975 - Jul. 1977

Pao C. Huang, Kenneth C. Kiddy, and John P. Matra, Jr. Sep. 1977 207 p

(AD-A049663; NSWC/WOL/TR-77-85) Avail: NTIS

HC A10/MF A01 CSCL 13/13

A Missile Junction Input Generator (JIG, A NASTRAN pre-processor) is presented in this report. It is a pre-processor for NASTRAN analyses of missile junctions. Using JIG a finite element model can be automatically generated and NASTRAN bulk data cards punched, thus enabling a complicated structure to be accurately and rapidly analyzed. Author (GRA)

N78-20546# Northwestern Univ., Evanston, Ill. Technological Inst.

SOME CONSIDERATIONS OF ELASTIC ANALYSES OF DISCRETE MODELS OF SOLIDS

Bruno A. Boley Nov. 1977 13 p refs

(Contract N00014-75-C-1042)

(AD-A049677; TR-1977-3) Avail: NTIS HC A02/MF A01 CSCL 20/11

The possibility is examined of studying the behavior of elastic solids on the basis of a model which considers them to be made up by a very large number of elementary particles arranged in a regular lattice array. Some of the simplifications which are needed (e.g., the neglect of surface tension) to make the analysis practical are examined, first in general terms and then for the simple case of a bar in tension. Author (GRA)

N78-20547# Washington Univ., Seattle. Dept. of Mechanical Engineering.

DYNAMIC PROELASTICITY AND DYNAMIC FINITE ELEMENT ANALYSES OF POLYCARBONATE DYNAMIC TEAR TEST SPECIMENS Interim Report

S. Wall, A. S. Kobayashi, and Y. Urabe Jan. 1978 26 p refs

(Contract N00014-76-C-0060)

(AD-A049681; TR-32) Avail: NTIS HC A03/MF A01 CSCL 11/9

Dynamic photoelasticity and dynamic finite element methods were used to study dynamic responses of dynamic tear test (DTT) specimens of a ductile material, i.e. 3.2 mm (1/8 in.) thick polycarbonate sheets. Dynamic photoelastic patterns before and after the onset of unstable fracture showed that the dynamic fracture initiation toughness, K sub id, was attained during the second maximum load in the hammer load-time history and was approximately 65 percent of the fracture toughness, K sub ic. Also dynamic stress intensity factors before and after crack propagation computed by dynamic finite element method using experimentally determined hammer load-time history were in reasonable agreement with those obtained from dynamic photoelasticity. The computed dynamic stress intensity factor prior to crack propagation was also in excellent agreement with the static stress intensity factors computed from dynamic strains adjacent to the crack tip. Author (GRA)

N78-20548# Argonne National Lab., Ill. Components Technology Div.

PLASTIC INSTABILITY CRITERIA FOR NECKING OF BARS AND BALLOONING OF TUBES

E. I. H. Lin 1977 14 p refs Presented at the 4th Intern. Conf. on Structural Mech. in Reactor Tech., San Francisco, 15 Aug. 1977

(Contract W-31-109-eng-38)

(CONF-770807-36) Avail: NTIS HC A02/MF A01

Plastic instability criteria for rate-sensitive materials have been derived in two cases. The first concerns necking in bars under uniaxial tension, and the second ballooning in thin-wall tubes under internal pressure and axial loading. These derivations, primarily based on geometrical considerations, differ in approach from most previous investigations. The results obtained enable explanation of certain interrelationships of uniform elongation, localized deformation, superplasticity, the state of stress and strain, and the material's hardening capability and strain-rate sensitivity. ERA

N78-20549# California Univ., Livermore. Lawrence Livermore Lab.

FRACTURE STUDIES WITH TWO- AND THREE-DIMENSIONAL COMPUTER SIMULATION PROGRAMS

M. L. Wilkins 18 Jan. 1977 17 p refs Presented at Conf. on Fracture Mechanics and Technol., Hong Kong, China, 21 Mar. 1977

(Contract W-7405-eng-48)

(UCRL-78376; Conf-770309-1) Avail: NTIS HC A02/MF A01

Large computers using finite element and finite difference techniques can solve the fundamental equations of stress and strain without simplifying assumptions. The application of these techniques to fracture have two fundamental requirements: the model for material failure by fracture, and a method for representing fracture and fracture propagation in the calculational grid. These two requirements were studied in ductile fracture of aluminum. Experimental load extension curves for tension tests were simulated with a finite difference program. A fracture model was developed that assumes damage in ductile fracture accumulates in the form of small voids that grow with strain until the material can no longer support the applied load. When a critical damage is reached the boundary conditions appropriate for a crack are introduced into the simulation program. ERA

N78-20550# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.

CRACK PROPAGATION AND RESIDUAL STATIC STRENGTH IN SHEETS OF Al Cu Mg 1 AND Al Zn Mg Cu 1.5 UNDER DYNAMIC BENDING LOADS [UNTERSUCHUNGEN ZUR RISSAUSBREITUNG UND RESTFESTIGKEIT IN BLECHEN AUS Al Cu Mg 1 UND Al Zn Mg CU 1,5 UNTER DYNAMISCHER BIEGEBELASTUNG]

Josef Sternberg 1977 72 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft

(ILR-19; ISBN-3-7983-0584-6) Avail: NTIS HC A04/MF A01

Crack propagation in plates of Al Cu Mg 1 and Al Zu Mg Cu 1.5 aluminum alloys under dynamic bending loads was investigated for several mean stresses and different plate thicknesses. Crack length l was measured as a function of the load cycle N in order to determine the crack propagation lambda = dl/dN. The crack propagation is described as a function of crack length, load, and critical stress intensity factor based on empirical relations between crack propagation and characteristic stress intensity. The residual static strength was determined for given crack length. ESA

N78-20551# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

ANALYSIS AND SYNTHESIS OF OPERATIONAL LOADS [ANALYSE UND SYNTHESE VON BETRIEBSBELASTUNGEN]

J. H. Argyris, W. Aicher, and H. J. Ertelt Feb. 1976 71 p refs In GERMAN

(ISD-193) Avail: NTIS HC A04/MF A01

The method for the analysis and synthesis of operational loads dealt with is based on the possibility of subjecting the test piece to a practically arbitrary load sequence. This method was proposed for the basis for standardization of aircraft structure fatigue tests using microcomputers. In order to obtain this standardization, system-dependent errors were eliminated from available flight data, a data reduction was carried out, matrices of transition probabilities were drawn up, and synthetic maximum load sequences were produced on punched tape and magnetic tape, respectively, for test facilities without direct computer control. ESA

N78-20552# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

INTRODUCTION TO THE MECHANICS OF IDEAL PLASTIC MATERIALS [EINFUEHRUNG IN DIE MECHANIK IDEAL PLASTISCHER STOFFE]

William Prager May 1976 76 p refs In GERMAN

(ISD-196) Avail: NTIS HC A05/MF A01

A number of lectures on the mechanics of ideal plastic materials is presented. The following topics are discussed: rigid ideal plastic support structures, elastic ideal plastic support structures, and plane plastic deformation. ESA

N78-20553# Naval Construction Research Establishment, Dunfermline (Scotland).

SPAN. USER'S SUMMARY (ITEM 6A2)

G. C. Mitchell Mar. 1977 25 p

(NCRE/R630-Add; BR57609) Avail: NTIS HC A02/MF A01

Instructions for use of SPAN, a computer program for static and dynamic analysis of stiffened plates and grillages, are given. SPAN is written in FORTRAN for a CDC 6600 computer. Calculations are based on the finite element method. ESA

N78-20554# Sydney Univ. (Australia). Civil Engineering Labs.
POST-BUCKLING BEHAVIOUR OF ELASTIC CIRCULAR ARCHES
H. B. Harrison Aug. 1977 38 p refs
(PB-275455/4; R-308) Avail: NTIS HC A03/MF A01 CSCL 20K

Three circular, pin-based arches were subjected to accurate, second order elastic analyses in order to study their postbuckling behavior. Two low rise arches and one of full semicircular shape were studied using a discrete element technique previously developed for the numerical analysis of beam-columns. Under central point loading, the low rise arches exhibited unstable postbuckling responses whereas that of the semicircular arch was found to be stable. Each arch was analyzed also for the case where the load was displaced slightly from the central position. The resulting load deformation curves are helpful in understanding the nature of equilibrium bifurcation in arches. In the process, the discrete element method is confirmed as a powerful and practicable method for the analysis of arches of any shape and under any loading conditions. GRA

N78-20555# Sydney Univ. (Australia). Civil Engineering Labs.
THE BEHAVIOUR OF BUILT-UP COMPOSITE COLUMNS
R. Q. Bridge and J. W. Roderick Jul. 1977 35 p refs
(PB-275456/2; R-306) Avail: NTIS HC A03/MF A01 CSCL 13M

The results are presented of an investigation into the behavior of pinended composite columns containing more than one steel component. A series of tests was performed on built-up composite columns containing two steel channels with and without battens and encased in unreinforced concrete. Comparative tests were made on similar unencased columns. An iterative inelastic analysis for composite columns was developed to predict their behavior right up to collapse. Comparisons between theoretical and experimental behavior were made. The observed results confirm the analytical predictions and lead to the conclusion that the absence of battens does not detract from the load carrying capacity of built-up composite columns of the type considered. GRA

N78-20556# Sydney Univ. (Australia). Civil Engineering Labs.
THE ANALYSIS OF COMPOSITE BEAMS
P. Ansourian and J. W. Roderick Aug. 1977 37 p refs
(PB-275454/7) Avail: NTIS HC A03/MF A01 CSCL 13M

An analysis is presented for predicting the behaviour of composite beams consisting of a concrete slab attached to a steel beam by a shear connection. The effects of interface slip due to the flexibility of the connectors are included, as are the effects of residual stresses and non-linearity in the steel and concrete. Elastic methods of analysis are reviewed with the aim of assessing the errors introduced by the conventional T-beam assumption. Comparisons were made with test results on beams having adequate or inadequate shear connections, and having the relatively high width to span ratio of 0.35. In the nonlinear range it was found that the effects of slip and residual stress were significant and could raise deflections by as much as 100 per cent. GRA

N78-20557# California Univ., Richmond. Earthquake Engineering Research Center.
DYNAMIC PLASTIC ANALYSIS USING STRESS RESULTANT FINITE ELEMENT FORMULATION
Panitan Lukkunaprasit and James N. Kelly Sep. 1977 61 p refs
(Grant NSF ENV-76-04262)
(PB-275453/9; UCB/EERC-77/21) Avail: NTIS HC A04/MF A01 CSCL 20K

A local time step subdivision procedure was developed to stabilize the direct numerical integration on the system of nonlinear dynamic equations.The simple nonlinear viscoplastic constitutive model approximates the nonlinear dynamic behavior of metals over a wide range of strain rates. Direct step by step integration techniques were used to solve the system of equations governing the motion of a structure under dynamic loading. An implicit Runge-Kutta scheme in conjunction with a Newton-Raphson iteration technique was used in solving systems of first order ordinary differential equations. Author (GRA)

N78-20362*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
METHODS OF COMPONENT MODE SYNTHESIS
R. R. Craig, Jr. *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 11 Nov. 1977 p 3-10 refs (For availability see N78-20361 11-31)
(Grant NsG-1268)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

N78-20363# Battelle Columbus Labs., Ohio. Applied Dynamics and Acoustics Section.
DYNAMIC MODELING OF PRESSURE VESSELS AND PIPING SYSTEMS
R. H. Prause *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 11 Nov. 1977 p 13-19 refs (For availability see N78-20361 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

N78-20366# Florida Univ., Eglin AFB. Graduate Engineering Center.
RESPONSE AND FAILURE OF SIMPLE STRUCTURAL ELEMENTS SUBJECTED TO BLAST LOADINGS
C. A. Ross, W. S. Strickland (Air Force Armament Lab.), and R. L. Sierakowski *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 9, No. 12 Dec. 1977 p 15-26 refs (For availability see N78-20365 11-31)
Avail: Naval Research Laboratory, Code 8404, Washington, D. C. 20375; $15.00/SET CSCL 20K

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N78-20558 Ohio State Univ., Columbus.
EXPERIMENTS FOR IMPROVED POSITIONING BY MEANS OF INTEGRATED DOPPLER SATELLITE OBSERVATIONS AND THE NNSS BROADCAST EPHEMERIS Ph.D. Thesis
Manohar Ganeshrao Arur 1977 142 p
Avail: Univ. Microfilms Order No. 7731815

The satellite ephemeris was available in two forms. The broadcast ephemeris which was received on real time basis, was predictive and had larger uncertainties than the post fitted precise ephemeris whose availability was restrictive. Comparison of precise and broadcast ephemerides, treating the former as the standard, yielded information about the state disturbances that were associated with the broadcast ephemeris. Statistical information about the state disturbances was used with current observational data for improved position recovery. The rank deficiency problem encountered in the short arc geodetic adjustment procedure was analyzed and it was deduced that the fundamental rank deficiency is six, scale information being derivable from the wavelength of transmission. Coordinate differences between stations coobserving a pass were estimable. Dissert. Abstr.

N78-20559 Indiana Univ., Bloomington.
MINERAL RESOURCES AS AN ELEMENT IN LAND USE PLANNING FOR EAST CENTRAL INDIANA Ph.D. Thesis
Peter Leonard Calengas 1977 186 p
Avail: Univ. Microfilms Order No. 77-30279

The most important mineral resources of this region were the aggregates; sand and gravel and crushed stone. Extractive mineral operations were permitted in certain designated districts in the region by a special use permit, obtained on approval of a board of zoning appeals upon meeting certain restrictive requirements and regulations that vary among counties and cities in the region. Land use conflicts arose around metropolitan areas, as they were zoned residential, thereby excluding mineral extraction and thus forcing mineral extraction operations to locate farther away from their market area, thereby increasing the cost of the mineral commodities. To insure a future mineral resource supply, and to prevent possible future land use conflicts, planning recommendations are presented. Dissert. Abstr.

N78-20560 California Univ., Berkeley.
THE MAGMA CHAMBER OF THE BISHOP TUFF: GRADIENTS IN TEMPERATURE, PRESSURE, AND COMPOSITION Ph.D. Thesis
Edward Wesley Hildreth 1977 228 p
Avail: Univ. Microfilms Order No. 7731399

An enigma raised by the data concerns the range of depths tapped by the eruption. Internally consistent thermodynamic relations indicated a range of pressures from 0.7 to 4.5 kb but the eruptive volume represented only a 1 km drawdown of the magma reservoir into which the cauldron-block subsided. The geologic and petrologic evidence was in good agreement that the chamber roof was quite shallow (2 - 5 km). Whole-rock major-element gradients were modest, but many trace-element concentration gradients were very steep despite a drop of only 2.5 weight % SiO2 within the magma volume erupted. REE patterns for whole-rocks glass, and several crystalline phases were steep and exhibit large Eu anomalies. The degree of LREE/HREE fractionation increased with temperature, while the Eu anomalies diminish. Crystal-liquid partition coefficients calculated for nine REE and 13 other trace elements are generally higher than hitherto published values for biotite, zircon, apatite, pyroxenes, and feldspars in silicic volcanic rocks. Dissert. Abstr.

N78-20561 Texas A&M Univ., College Station.
DISTORTION MEASUREMENT BETWEEN PHOTOGRAPHIC IMAGES: A NEW ROCK-MECHANICS TOOL Ph.D. Thesis
William Daniel Heinze 1977 148 p
Avail: Univ. Microfilms Order No. 7732165

The development of a technique for determining the local microscopic stresses with sufficient accuracy to determine these cracking stresses quantitatively was studied. Photomicrographs of a thin rock wafer at sequential increments of load were digitized, and the strain and displacement fields for each increment of load were computed from numerical comparison of the photos. From knowledge of the strain variation within a grain and its anisotropic elastic stiffness, the stress field was determined. The accuracy with which the strains and displacements can be determined depends on the quality of the photographic image and its spatial frequency content; the greater the high frequency content, the higher the accuracy. The technique was tested on optical, transmitted light photomicrographs of Westerly granite. Dissert. Abstr.

N78-20562 Oregon Univ., Eugene.
AN INVESTIGATION INTO THE COMPARATIVE UTILITY OF COLOR INFRARED AERIAL PHOTOGRAPHY AND LANDSAT DATA FOR DETAILED SURFACE COVER TYPE MAPPING WITHIN CRATER LAKE NATIONAL PARK, OREGON Ph.D. Thesis
Stephen Joseph Walsh 1978 388 p
Avail: Univ. Microfilms Order No. 7732070

Slope angle, slope aspect, and surface cover type variation, and to a lesser degree, crown size and crown density were the main environmental factors which accounted for spectral reflectance variation of surface cover types. Through an understanding of the influence of environmental factors in the reflectance value of surface cover types, the quality of training statistics and the location of training areas were evaluated in order to reduce misclassification or nonclassification possibilities. A regression analysis, analysis of variance, T values, F values, and beta values were used to determine the relative degree that certain environmental factors influenced the spectral reflectance of surface cover types producing a change in the mean reflectance of surface cover types per LANDSAT band. Dissert. Abstr.

N78-20563 Oklahoma State Univ., Stillwater.
STREAMFLOW SYNTHESIS EMPLOYING A MULTI-ZONE HYDROLOGIC MODEL WITH DISTRIBUTED RAINFALL AND DISTRIBUTED PARAMETERS Ph.D. Thesis
David Gordon Morris 1977 251 p
Avail: Univ. Microfilms Order No. 78-01301

A multizone conceptual hydrologic simulation model was programmed featuring the capability to model only catchment total drainage area, or to account for the spatial variability of rainfall and parameters. Calibration of eight watersheds was achieved with the hydrologic model operating in each of the three modes. A tabulation of simulation results were made based on standard statistical comparisons of mean daily flows. From these traditional measures it was not possible to determine multizone model performance behavior. Consequently, a filtering statistic was created and a simple error function employed to process instantaneous flows and compute simulation errors in peak flow, timing, and storm runoff volume. Significant improvement in storm flow simulation may be obtained using a multizone model for basins subjected to intense convective rainstorms, and the improvement is possible even when the rain gage network is not sufficiently dense across the watershed to closely define storm pattern. Dissert. Abstr.

N78-20564 State Univ. of New York, Buffalo.
METHODS IN DATA REDUCTION Ph.D. Thesis
Basile Dimitrios Dimitriadis 1977 243 p
Avail: Univ. Microfilms Order No. 7732650

Linear classification is examined under a given optimality criterion and classes of admissible classification rules found are described. It is shown that the classification technique is nonparametric and that the dimensionality of the data, or the number of classes do not affect its simplicity. An algorithm is given for the implementation of the classification technique. Sequential classification is examined under Markov dependence. Implementation by a simple processing module is emphasized. In cases where the data are deterministic a smoothing spline technique is proposed in order to reduce data dimensionality and improve signal to noise ratio. A fast Fourier transformation subroutine is used on the raw data to perform the spline fitting resulting in a controlled data smoothing and reduction. An algorithm is given for the implementation of the spline technique. Dissert. Abstr.

N78-20565*+ National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 16, JANUARY 1978
Jan. 1978 125 p
(NASA-SP-7041(16)) Avail: NTIS HC E05 CSCL 05B

This bibliography lists 543 reports, articles, and other documents introduced into the NASA scientific and technical information system between October 1 and December 31, 1977. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. Author

N78-20566*# Department of the Environment, Ottawa (Ontario).
RETRANSMISSION OF HYDROMETRIC DATA IN CANADA Qsurterly Report, Oct. - Dec. 1977
R. A. Halliday, Principal Investigator and I. A. Reid Feb. 1978 8 p Sponsored by NASA ERTS
(E78-10091; NASA-CR-155772) Avail: NTIS HC A02/MF A01 CSCL 08H

The author has identified the following significant results. The feasibility of transmitting hydrometric data in the LANDSAT and GOES mode and using these data operationally was demonstrated. All elements except for the GOES downlink at PASS are functioning well.

N78-20567*# Nebraska Univ., Lincoln.
APPLICATIONS OF REMOTE SENSING IN RESOURCE MANAGEMENT IN NEBRASKA Annual Report, 1 May 1976 - 30 Apr. 1977
Marvin P. Carlson, Principal Investigator 30 Apr. 1977 92 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Grant NGL-28-004-020)
(E78-10099; NASA-CR-155801) Avail: NTIS HC A05/MF A01 CSCL 05A

There are no author-identified significant results in this report.

N78-20568*# South Dakota State Univ., Brookings. Remote Sensing Inst.
INVESTIGATION OF REMOTE SENSING TECHNIQUES AS INPUTS TO OPERATIONAL RESOURCE MANAGEMENT Final Report, 10 Mar. 1975 - 11 Jun. 1977
Fred A. Schmer, Principal Investigator, Robert E. Isakson, and Jeff C. Eidenshink Jun. 1977 172 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(Contract NAS5-20982)
(E78-10100; NASA-CR-155962; SDSU-RSI-77-12; Rept-7) Avail: NTIS HC A08/MF A01 CSCL 05A

The author has identified the following significant results. Visual interpretation of 1:125,000 color LANDSAT prints produced timely level 1 maps of accuracies in excess of 80% for agricultural land identification. Accurate classification of agricultural land via digital analysis of LANDSAT CCT's required precise timing of the date of data collection with mid to late June optimum for western South Dakota. The LANDSAT repetitive nine day cycle over the state allowed the surface areas of stockdams and small reservoir systems to be monitored to provide a timely approximation of surface water conditions on the range. Combined use of DIRS, K-class, and LANDSAT CCT's demonstrated the ability to produce aspen maps of greater detail and timeliness than was available using US Forest Service maps. Visual temporal analyses of LANDSAT imagery improved highway map drainage information and were used to prepare a seven county drainage network. An optimum map of flood-prone areas was developed, utilizing high altitude aerial photography and USGS maps.

N78-20569*# Corps of Engineers, Waltham, Mass.
THE USE OF THE LANDSAT DATA COLLECTION SYSTEM AND IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Final Report
Saul Cooper, Principal Investigator, Timothy D. Buckelew, Harlan L. McKim (Cold Regions Research and Engineering Lab., Hanover, N. H.), and Carolyn J. Merry (Cold Regions Research and Engineering Lab., Hanover, N. H.) Nov. 1977 168 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E78-10102; NASA-CR-155964) Avail: NTIS HC A08/MF A01 CSCL 05B

The author has identified the following significant results. An increase in the data collection system's (DCS) ability to function in the flood control mission with no additional manpower was demonstrated during the storms which struck New England during April and May of 1975 and August 1976. It was found that for this watershed, creditable flood hydrographs could be generated from DCS data. It was concluded that an ideal DCS for reservoir regulation would draw features from LANDSAT and GOES. MSS grayscale computer printout and a USGS topographic map were compared, yielding an optimum computer classification map of the wetland areas of the Merrimack River estuary. A classification accuracy of 75% was obtained for the wetlands unit, taking into account the misclassified and the unclassified pixels. The MSS band 7 grayscale printouts of the Franklin Falls reservoir showed good agreement to USGS topographic maps in total area of water depicted at the low water reservoir stage and at the maximum inundation level. Preliminary analysis of the LANDSAT digital data using the GISS computer algorithms showed that the radiance of snow cover/vegetation varied from approximately 20 mW/sq cm sr in nonvegetated areas to less than 4 mW/sq cm sr for densely covered forested area.

N78-20570*# Michigan State Univ., East Lansing.
USE OF REMOTE SENSING FOR LAND USE POLICY FORMULATION Semiannual Progress Report, Jun. - Nov. 1977
Myles Boylan, Principal Investigator 14 Mar. 1978 57 p refs ERTS
(Grant NGL-23-004-083)
(E78-10103; NASA-CR-155968) Avail: NTIS HC A04/MF A01 CSCL 08B

The author has identified the following significant results. By utilizing remote sensing techniques, it was possible to accurately inventory a relatively large area for sand mining impact on protection and management of shoreland dunes within a limited time period and at a relatively low cost. Analysis of two sample areas selected from the Grand Mere area after prohibition of off-road-vehicle use indicated an increase in vegetation regrowth of 8.52% for sample area 1 and of 4.44% for sample area 2.

N78-20571*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
BAYESIAN CLASSIFICATION IN A TIME-VARYING ENVIRONMENT
Philip H. Swain 1 Mar. 1978 21 p refs
(Contract NAS9-14970)
(NASA-CR-151660; LARS-TR-030178) Avail: NTIS HC A02/MF A01 CSCL 12B

The problem of classifying a pattern based on multiple observation made in a time-varying environment is analyzed. The identity of the pattern may itself change. A Bayesian solution is derived, after which the conditions of the physical situation are invoked to produce a cascade classifier model. Experimental results based on remote sensing data demonstrate the effectiveness of the classifier. Author

N78-20572*# Applied Science Associates, Inc., Apex, N. C.
CORRELATION OF SIGMA DEG (0 DEG) INFERRED WIND SPEED ESTIMATES WITH NOAA HINDCAST DATA
Gary S. Brown Mar. 1978 21 p refs
(Contract NAS6-2810)
(NASA-CR-141437) Avail: NTIS HC A02/MF A01 CSCL 04B

Microwave remote sensing is discussed in terms of using GEOS-3 data to infer surface wind speed. Topics covered include: determining surface wind speed from backscattering, estimating surface winds from near normal incidence scattering, and response of the centimeter wavelength components of the ocean surface height spectrum to the wind. J.M.S.

N78-20573*# Southwest Research Inst., San Antonio, Tex.
COAL THICKNESS GAUGE USING RRAS TECHNIQUES, PART 1 Final Report
W. L. Rollwitz and J. Derwin King 20 Jan. 1978 97 p refs
(Contract NAS8-32606)
(NASA-CR-150625; SwRI-15-4967) Avail: NTIS HC A05/MF A01 CSCL 08I

A noncontacting sensor having a measurement range of 0 to 6 in or more, and with an accuracy of 0.5 in or better is needed to control the machinery used in modern coal mining so that the thickness of the coal layer remaining over the rock is maintained within selected bounds. The feasibility of using the radiofrequency resonance absorption (RRAS) techniques of electron magnetic resonance (EMR) and nuclear magnetic resonance (NMR) as the basis of a coal thickness gauge is discussed. The EMR technique was found, by analysis and experiments, to be well suited for this application. Author

N78-20574*# Computer Sciences Corp., Huntsville, Ala. Aerospace Systems Center.
DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA
A. D. Bond, R. J. Atkinson, M. Lybanon, and H. K. Ramapriyan

Dec. 1977 285 p refs Original contains color illustrations (Contract NAS8-21805)
(NASA-CR-2932; M-240) Avail: NTIS HC A13/MF A01 CSCL 05B

Computer processing procedures and programs applied to Multispectral Scanner data from LANDSAT are described. The output product produced is a level 1 land use map in conformance with a Universal Transverse Mercator projection. The region studied was a five-county area in north Alabama. Author

N78-20575*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SOLAR REFLECTANCE OF A SNOW FIELD
B. J. Choudhury (Computer Sciences Corp.) and A. T. C. Chang Jan. 1978 25 p refs
(NASA-TM-78085) Avail: NTIS HC A02/MF A01 CSCL 08L

The radiative transfer equation was solved using a modified Schuster-Schwartzschild approximation to obtain an expression for the solar reflectance of a snow field. The parameters in the reflectance formula are the single scattering albedo and the fraction of energy scattered in the backward direction. The single scattering albedo is calculated from the crystal size using a geometrical optics formula and the fraction of energy scattered in the backward direction is calculated from the Mie scattering theory. Numerical results for reflectance are obtained for visible and near infrared radiation for different snow conditions. Good agreement was found with the whole spectral range. The calculation also shows the observed effect of aging on the snow reflectance. Author

N78-20576*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PASSIVE MICROWAVE STUDIES OF SNOWPACK PROPERTIES
D. K. Hall, A. T. C. Chang, J. L. Foster (Systems and Applied Sciences Corp.), A. Rango, and T. Schmugge Apr. 1978 15 p refs - Presented at the Western Snow Conf., Otter Rock, Oreg., 18-20 Apr. 1978
(NASA-TM-78089) Avail: NTIS HC A02/MF A01 CSCL 08L

Microwave brightness temperatures were measured for the snowpacks at Walden and Steamboat Springs, Colorado during 1976 and 1977 aircraft experiments. Variations in measured brightness temperatures are attributed to snow grain and crystal sizes, liquid water content, and snowpack temperature. Results demonstrate that shorter wavelength radiation is scattered more strongly than longer wavelength radiation. J.M.S.

N78-20577*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PILOT TESTS OF SATELLITE SNOWCOVER/RUNOFF FORECASTING SYSTEMS
Albert Rango Mar. 1978 17 p refs Presented at 46th Ann. Western Snow Conf., Otter Rock, Oregon, 18-20 Apr. 1978 Sponsored in part by Geological Survey, Soil Conservation Service, Bureau of Reclamation, Bonneville Power Administration, Corps of Engineers, NOAA, California Dept. of Water Resources, Colorado Div. of Water Resources, and Arizona Salt River Project
(NASA-TM-78109) Avail: NTIS HC A02/MF A01 CSCL 08L

Major snow zones of the western U.S. were selected to test the capability of satellite systems for mapping snowcover in various snow, cloud, climatic, and vegetation regimes. Different satellite snowcover analysis methods used in each area are described along with results. Author

N78-20578# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON MAPPING AND TOPOGRAPHIC MEASUREMENTS. SERIES 1: ORIGINAL CONTRIBUTIONS, ISSUE NO. 72 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 72]
1977 122 p refs In GERMAN; ENGLISH summaries Presented at the 13th Meeting of the Working Group Automation in der Kartographie, Wiesbaden, 15-16 Sep. 1976
Avail: NTIS HC A06/MF A01

Topics are presented in the field of computer applications to mapping. Several computerized digitizing systems for cartography are discussed, as well as peripheral equipment such as drafting machines. For individual titles, see N78-20579 through N78-20589.

N78-20579# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATIC METHODS FOR SOLVING THE GENERALIZATION PROBLEM [WEGE DER AUTOMATISIERUNG ZUR LOESUNG DES GENERALISIERUNGSPROBLEMS]
Arno Berger *In its* Rept. on Mapping and Topographic Meas. 1977 p 5-8 refs In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

Different methods of automating cartographic generalization on topographic maps are described and their importance as to the simplification of the generalization problem by manipulating the map design is emphasized. It is further required that, for the benefit of a swift solution of the manifold generalization tasks, either machine functions or special setups (e.g. binary image processing) be also applied to scales larger than 1:200000. For this purpose, it would be desirable that map specifications should be examined as to adequate information content, and that map design be adapted to automation. Author (ESA)

N78-20580# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
KARTOSCAN, A NEW DIGITAL SCANNER FOR CARTOGRAPHY [KARTOSCAN, EIN NEUES DIGITALES AUFNAHMEGERAET FUER DIE KARTOGRAPHIE]
Otto Hofmann *In* Inst. fuer Angew. Geodaesie Rept. on Mapping and Topographic Meas. 1977 p 9-13 In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

A flat-bed scanner was developed for the digitizing of all kinds of graphic originals. The scanner is equipped with the latest, highly resolving photo sensors scanning the original in raster and areal form. Extensive software packages complete the device, thus making it a universally usable aid to cartography. Author (ESA)

N78-20581# Eidgenoessische Technische Hochschule, Zurich (Switzerland).
ESSENTIAL ASPECTS OF THE CONCEPTION AND APPLICATION OF THE DIGITAL CARTOGRAPHIC DRAFTING MACHINE OF THE ETH ZURICH [WESENTLICHE ASPEKTE DER KONZEPTION UND ANWENDUNG DER DIGITALEN KARTOGRAPHISCHEN ZEICHENANLAGE DER ETH ZUERICH]
Christian Hoinkes *In* Inst. fuer Angew. Geodaesie Rept. on Mapping and Topographic Meas. 1977 p 15-37 In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

A complete system for computer-aided digitizing, processing, and final drafting of cartographic data was installed at the Department of Cartography of the Swiss Federal Institute of Technology (ETH) in Zurich. The basic ideas behind the systems concept and the configuration of equipment are described. Some practical examples are given of the use of the system, experience so far briefly described, and some hints are made at the main directions of future application of the system. Author (ESA)

N78-20582# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATED CARTOGRAPHY IN BAVARIAN AGRICULTURAL PLANNING [AUTOMATISIERTE KARTOGRAPHIE IN DER BAYERISCHEN AGRARLEITPLANUNG]
Richard Hoisl *In its* Rept. on Mapping and Topographic Meas. 1977 p 39-51 refs In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

The Agricultural Administration of Bavaria, an administration without cartographic tradition, handles new planning tasks by applying automated graphic data processing in connection with an existing information system. The arising cartographic tasks, their problems and solutions by means of automation are described. Author (ESA)

N78-20583# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE DATA PROCESSING SYSTEM OF THE MILITARY SURVEY OFFICE AND ITS USE FOR MILITARY THEMATIC MAPPING [DIE AUTOMATIONSANLAGE DES MILITAER-GEOGRAPHISCHEN AMTES UND IHR EINSATZ IN DER MILITAER-THEMATISCHEN KARTOGRAPHIE]

Juergen Kunz *In its* Rept. on Mapping and Topographic Meas. 1977 p 53-64 In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

The automation system of the Military Survey Office at Bonn-Bad Godesberg is described with respect to the possibilities of its use for the processing of military-geographical documents. The special EDP-aided processing methods in the batch-mode of operation, as well as in military-thematic cartography are described. Author (ESA)

N78-20584# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

EDP SUPPORTED REALIZATION OF DISPLACEMENT PROCESSES IN THE CARTOGRAPHIC GENERALIZATION OF TOPOGRAPHIC MAPS [EDV-UNTERSTUETZTE DURCHFUEHRUNG VON VERDRAENGUNGSPROZESSEN BEI DER KARTOGRAPHISCHEN GENERALISIERUNG IN TOPOGRAPHISCHEN KARTEN]

Werner Lichtner *In its* Rept. on Mapping and Topographic Meas. 1977 p 65-75 refs In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

A thoroughly tested model for the automatic performance of displacements in batch mode, where the displacement is controlled by linear operator is described. The suitability of different operators and the necessary dimensioning of the model are shortly discussed. Figures, showing the plotter drawings, demonstrate the suitability of the proposed algorithms for the standard cases of displacement as well as for special cases. Author (ESA)

N78-20585# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE CORAGRAPH DC 2 A DRAFTING MACHINE AND ITS CONNECTION TO THE PDP 11/45 PROCESSOR. NEW INSTALLATION AT THE NORTH RHINE WESTPHALIA CADASTRAL OFFICE [DIE ZEICHENANLAGE CORAGRAPH DC 2 A UND IHRE ANBINDUNG AN DEN PROZESS-RECHNER PDP 11/45. NEUINSTALLATION BEIM LANDES-VERESSUNGSAMT NORDRHEIN-WESFALEN]

G. Mittelstrass *In its* Rept. on Mapping and Topographic Meas. 1977 p 77-81 refs In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

The connection of the automatic drafting machine Coragraph DC 2 A (Contraves) to the computer PDP 11/45 (digital equipment) is described covering hardware and software. The effects on systems programs are discussed. Author (ESA)

N78-20586# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

PHOTOGRAMMETRIC METHODS FOR CREATION OF DIGITAL SITUATION MODELS [PHOTOGRAMMETRISCHE METHODE ZUR SCHAFFUNG DIGITALER SITUATIONS-MODELLE]

H. G. Neubauer *In its* Rept. on Mapping and Topographic Meas. 1977 p 83-89 In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

A project on the digital evaluation of aerial photographs is reported. Studies carried out to create a digital model of planimetry for cartographic purposes are described and the requirements to be met by the procedure, the details of measurement, the subdivision of computations, and the design of documents for field comparison are considered. Author (ESA)

N78-20587# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

DIGITAL IMAGE PROCESSING IN PHOTOGRAMMETRY. APPLICATION POSSIBILITIES FOR CARTOGRAPHIC PROBLEMS [DIGITALE BILDVERARBEITUNG IN DER PHOTOGRAMMETRIE. ANWENDUNGSMOEGLICHKEITEN FUER KARTOGRAPHISCHE AUFGABENSTELLUNGEN]

B. S. Schulz *In its* Rept. on Mapping and Topographic Meas. 1977 p 91-95 refs In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

The suitability of an edge extraction method for the data reduction of aerial photographs and its applicability to cartographic tasks are examined. Procedures based on this method are described and applied to image analysis and determination of the different natures of land use by means of digital image processing. Author (ESA)

N78-20588 Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany).

REPRESENTATION AND DIGITIZING FOR AREA ENCODING [EIN BEITRAG ZUR DARSTELLUNG UND DIGITALISIERUNG FLAECHENHAFTER BEZUGSEINHEITEN]

Ronald Tost *In* Inst. fuer Angew. Geodaesie Rept. on Mapping and Topographic Meas. 1977 p 97-102 In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

Two alternative methods for area encoding combined with computing procedures are presented. The first one is based on area processing by a closed line: the digitizer traces around a given area on the map, and the points representing the edge are either selectively (point mode) or continuously (on-the-fly method) stored on tape. The second one is based on area processing by segments, in which case the digitizer recognizes nodes on the map or possibly special marks. The relationship between segment and mesh is established by computer aid.ESA

N78-20589# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

SOME CARTOGRAPHIC APPLICATIONS OF DIGITAL IMAGE PROCESSING [EINIGE KARTOGRAPHISCHE ANWENDUNGEN DER DIGITALEN BILDVERARBEITUNG]

Wigand Weber *In its* Rept. on Mapping and Topographic Meas. 1977 p 103-122 refs In GERMAN; ENGLISH summary (For availability see N78-20578 11-43)
Avail: NTIS HC A06/MF A01

Some examples of techniques for digital image processing to be used for problems in computer-aided cartography are presented. These are: production of multi-line symbols from skeleton lines, the conformal transformation, the interactive erasure of a line part, the coding of meshes, edges, and nodes of a planar graph, and the determination of classes of terrain slopes from maps with equidistant contour lines. It is demonstrated how these complex operations can be reduced to a few macros only (i.e. thickening, propagation, calculation of the distance transform, and convolution); these macros again are to be composed of a few primitive image operations. The problems related to the large data quantities and high computing times are also dealt with. Author (ESA)

N78-20590# Washington Univ., Seattle. Dept. of Atmospheric Sciences.

CENTRAL AVALANCHE HAZARD FORECASTING Final Report, Jul. 1976 - Jun. 1977

E. R. LaChapelle, R. T. Marriott, M. B. Moore, and P. L. Taylor Jun. 1977 125 p
(PB-274924/0; FHWA/WA-77/1) Avail: NTIS HC A06/MF A01 CSCL 13B

The second year of work is reviewed on the Washington State Highway Commission Department of Highways project Central Avalanche Hazard Forecasting to test the feasibility and effectiveness of central avalanche forecasting for the Cascade Mountain passes and adjacent area. The possibilities and techniques for improving both mountain weather and related avalanche forecasts for use during winter operation in the mountain passes were further explored. This report defines significant changes in collection, assimilation or transmission of snow, weather and avalanche data and details modifications of the data network itself. GRA

N78-20591# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.

FACTORS IN DESIGN OF HARDCOPY TOPOGRAPHIC MAPS

Lawrence M. Potash and Thomas E. Jeffrey Jan. 1978 36 p refs

(AD-A049621; ARI-TP-284) Avail: NTIS HC A03/MF A01 CSCL 08/2

A literature survey on factors in map design, including visual coding techniques and assessment techniques, is summarized in this report, as the first step in improving legibility and usefulness of hardcopy (printed) topographic maps. Map design determinants are scale, interrelatedness of symbols, and a body of standardized symbols and modes of coding. Map scale influences fidelity, as small scale requires selection, simplification, and magnification of features. Clutter can be reduced by coding to differentiate information: color coding aids in identification and reduces location time; iconic and alphanumeric shape coding can be learned easily and are flexible; size coding requires considerable space and increases location time. Among map assessment techniques, opinion sampling is relatively inexpensive but does not measure actual performance, and theoretical analysis is a limited first step only. Empirical analysis measures performance with the map product, either by assessing performance directly or by measuring the map-reading skills which underlie performance. GRA

N78-20592# Water Research Centre, Stevenage (England).
USE OF GROUNDWATER MODELS IN RESOURCE DEVELOPMENT AND MANAGEMENT
Jun. 1976 4 p refs
(WRC-RN-4) Avail: NTIS HC A02/MF A01

Numerical models are discussed for ground water systems. Their formulation and calibration are described, and their use in resource development and management is outlined. ESA

N78-20593# Food and Agriculture Organization of the United Nations, Rome (Italy). Plant Production and Protection Div.
PILOT PROJECT ON THE APPLICATION OF REMOTE SENSING TECHNIQUES FOR IMPROVING DESERT LOCUST SURVEY AND CONTROL Final Report, Sep. 1976
Jelle U. Hielkema and J. A. Howard 1976 85 p refs Original contains color illustrations
(ISBN-92-5-100112-X) Avail: NTIS HC A05/MF A01

The outlines of an international cooperative program to use existing and future satellite systems to provide rapid and comprehensive information on the occurrence of potential desert locust breeding sites are outlined. General locust ecology is discussed and a brief account is given of the satellite remote sensing techniques applied in the project. The discussion of the results includes rainfall estimates by satellite versus ground station observations. ESA

N78-20594# Food and Agriculture Organization of the United Nations, Rome (Italy). Plant Production and Protection Div.
APPLICATION OF LANDSAT DATA IN DESERT LOCUST SURVEY AND CONTROL. DESERT LOCUST SATELLITE APPLICATION PROJECT, STAGE 2
Jelle U. Hielkema Sep. 1977 34 p refs Original contains color illustrations
(ISBN-92-5-100402-1) Avail: NTIS HC A03/MF A01

Results obtained during the pilot project on the use of remote sensing techniques for desert locust survey and control justified a more detailed investigation on the potential use of LANDSAT data. The results are presented and discussed of a program consisting of a study on the correlation between ground observed and satellite observed vegetal growth; the assessment of factors influencing the run-off component of the precipitation, and the assessment of some operational aspects on the use of LANDSAT data in a vegetation monitoring scheme. ESA

N78-20595# World Meteorological Organization, Geneva (Switzerland).
CASEBOOK OF EXAMPLES OF ORGANIZATION AND OPERATION OF HYDROLOGICAL SERVICES
1977 143 p refs
(WMO-461; OHR-9; ISBN-92-63-10461-1) Avail: NTIS HC A07/MF A01; WMO, Geneva

Contributions from twelve countries on solutions to institutional and organizational problems encountered by them in setting up their hydrological services are presented. The countries are representative of services operating under various climatic, physiographic, and economic conditions. Each contribution covers six sections: introduction; role and goals of water in the national economy; water resources management; the hydrological service; effectiveness of the service; and future plans. ESA

N78-20596# North Carolina State Univ., Raleigh.
SEA GRANT IN NORTH CAROLINA. A REPORT ON THE UNIVERSITY OF NORTH CAROLINA SEA GRANT COLLEGE PROGRAM FOR 1976 Annual Report
Karen Jurgensen 1977 41 p refs Sponsored by NOAA Prepared in cooperation with North Carolina Univ., Chapel Hill
(PB-275375/4; NOAA-77110705) Avail: NTIS HC A03/MF A01 CSCL 13B

The research programs completed, underway or planned are summarized. A list of publications resulting from the various activities is included along with a copy of the Sea Grant Budget for 1976. GRA

N78-20597# Ecology Consultants, Inc., Fort Collins, Colo.
ANNOTATED BIBLIOGRAPHY OF NATURAL RESOURCE INFORMATION: NORTHWESTERN NEW MEXICO Final Report
Timothy W. Joseph and John Wood Sep. 1977 150 p Prepared in cooperation with Dames and Moore, Phoenix, Ariz.
(Contracts DI-14-16-0008-2156; DI-14-16-0006-3129)
(PB-276024/7; FWS/OBS-77/33; LC-77-90963) Avail: NTIS HC A07/MF A01 CSCL 13B

The flora, fauna and selected physical characteristics of the northwestern New Mexico ecological test area being studied are presented. This test area covers known coal deposit sites in the state. Published and unpublished documents located by April 1977 and pertinent to the test area are listed. Subject, author, geographic and species indexes are included. GRA

N78-20598# Geological Survey, Anchorage, Alaska.
WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1976 Annual Water-Data Report, 1 Oct. 1975 - 30 Sep. 1976
1977 405 p
(PB-275889/4; USGS/WDR/AK-76/1;
USGS/WRD/HD-77/043) Avail: NTIS HC A16/MF A01 CSCL 13B

Water resources data for the 1976 water year for Alaska consist of records of stage, discharge, and water quality of streams; stage and water quality of lakes; and water levels and water quality in wells and springs. Discharge records for 102 gaging stations; stage only records for 2 gaging stations; water quality for 71 stations; and water levels for 24 observation wells are included along with 91 crest-stage partial-record stations and 28 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements of discharge, lake stage, or water quality. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N78-20599 Georgia Univ., Athens.
THE ENERGY QUESTION: A CASE STUDY IN MAJOR PUBLIC POLICY DEVELOPMENT IN A QUASI-FREE ENTERPRISE SOCIETY Ph.D. Thesis
Howard Bucknell, III 1977 524 p
Avail: Univ. Microfilms Order No. 77-30452

The contemporary literature on policy analysis in the political science and public administration fields is presented, with some comment on purely economic approaches. The historic diversity of approaches was noted. The basic physical and economic factors involved in the energy situation are discussed,

and the emerging and contending political, economic, and ideologic attitudes involved in perceptions of the energy situation are presented. Special emphasis is given to a rational resource allocation model developed empirically in the tradition of an older discipline, political economy. Dissert. Abstr.

N78-20600 California Univ., Berkeley.
COAL ENERGY AND THE ENVIRONMENT: ANALYSIS OF ECONOMIC AND ENERGY EFFICIENCY IMPLICATIONS OF ENVIRONMENTAL AND RESOURCE CONSTRAINTS ON THE UTILIZATION OF COAL TO PRODUCE ELECTRICITY Ph.D. Thesis
George Chandler Ferrell 1977 768 p
Avail: Univ. Microfilms Order No. 7731350

Emphasis is placed on air quality, and on control of the three primary residuals: sulfur oxides, particulates and nitrogen oxides. Physical air quality, economic and health-related aspects of these residuals are reviewed and federal and state standards are briefly surveyed. Technologies that manage residuals in the coal-electric cycle are assessed in some detail, including the theory of operation, operating performance, commercial history, present status, potential commercial future, and cost. The technologies reviewed include: coal production, coal beneficiation, coal transportation, coal-electric generation, and emissions control technologies. Prior to an analysis of these technologies in case study coal-electric systems using modeling techniques, a brief energy and environmental modeling literature review is conducted. This survey emphasizes coal-energy and air quality modeling, including the topics of mathematical programming, optimal control, simulation, economic and planning methods, modeling workshops, and conferences. Dissert. Abstr.

N78-20601 Oklahoma State Univ., Stillwater.
AN EVALUATION OF GEOTHERMAL ENERGY POTENTIAL Ph.D. Thesis
Ashok R. Sapre 1974 156 p
Avail: Univ. Microfilms Order No. 7801371

The cost of power generated by using low grade geothermal energy existing under a variety of naturally occurring conditions was assessed. The low grade geothermal energy as defined for this study is the geothermal energy available in the areas where the temperature gradient is between 2 F and 5 F per 100 feet. The assessment of the cost of geothermal power was accomplished via development of a techno-economic model for the total system. The development of the model was divided into two parts. First, a mathematical model of the system was developed and then a compatible economic model was built for the cost evaluation. A set of data was then used to arrive at the cost of geothermal power by using the techno-economic model. Using the techno-economic model of the geothermal power system, the cost of geothermal power was assessed to be between 1.2 cents/KWH and 4.9 cents/KWH. Dissert. Abstr.

N78-20602*# Sigma Research, Inc., Richland, Wash.
INSTALLATION PACKAGE MAXI-THERM S-101 HEATING MODULE
12 Oct. 1977 33 p Prepared for DOE
(Contract NAS8-32260)
(NASA-CR-150512) Avail: NTIS HC A03/MF A01 CSCL 10A

The installation, operation and maintenance of the Maxi-Therm S-101 Thermosyphon Heating Module is described. The Maxi-Therm S-101 is a packaged unit, complete with air filter, blower, electrical controls, and a thermosyphon liquid to air heat exchanger. It is intended for use in residential solar heating systems and can utilize off-peak electrical power. Author

N78-20603*# Hawaii Univ., Honolulu.
EMPLOYING STATIC EXCITATION CONTROL AND TIE LINE REACTANCE TO STABILIZE WIND TURBINE GENERATORS Final Report
H. H. Hwang, H. V. Mozeico, and Tenhuei Guo Apr. 1978 77 p refs
(Grant NsG-3132; Contract E(49-26)-1004)
(NASA-CR-135344; DOE/NASA/3132-78/1) Avail: NTIS HC A05/MF A01 CSCL 10A

An analytical representation of a wind turbine generator is presented which employs blade pitch angle feedback control. A mathematical model was formulated. With the functioning MOD-0 wind turbine serving as a practical case study, results of computer simulations of the model as applied to the problem of dynamic stability at rated load are also presented. The effect of the tower shadow was included in the input to the system. Different configurations of the drive train, and optimal values of the tie line reactance were used in the simulations. Computer results revealed that a static excitation control system coupled with optimal values of the tie line reactance would effectively reduce oscillations of the power output, without the use of a slip clutch. Author

N78-20604*# IBM Federal Systems Div., Huntsville, Ala.
PRELIMINARY DESIGN REVIEW PACKAGE FOR THE SOLAR HEATING AND COOLING CENTRAL DATA PROCESSING SYSTEM
25 May 1976 153 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150594; IBM-76W-0060) Avail: NTIS HC A08/MF A01 CSCL 10A

The Central Data Processing System (CDPS) is designed to transform the raw data collected at remote sites into performance evaluation information for assessing the performance of solar heating and cooling systems. Software requirements for the CDPS are described. The programming standards to be used in development, documentation, and maintenance of the software are discussed along with the CDPS operations approach in support of daily data collection and processing. J.M.S.

N78-20605*# Scattergood School, West Branch, Iowa.
SOLAR HEATING SYSTEM FOR RECREATION BUILDING AT SCATTERGOOD SCHOOL Final Report
Conrad F. Heins 3 Jan. 1978 140 p refs
(Contract EX-76-C-01-2386)
(NASA-CR-150553) Avail: NTIS HC A07/MF A01 CSCL 10A

The solar heating facility and the project involved in its construction are described. As such, it has both detailed drawings of the completed system and a section that discusses the bottlenecks that were encountered along the way. Author

N78-20606*# Houston Chemical Co., Pittsburgh, Pa.
SOLAR HEAT TRANSPORT FLUIDS FOR SOLAR ENERGY COLLECTION SYSTEMS: A COLLECTION OF QUARTERLY REPORTS Progress Report, 15 Nov. 1976 - 15 Nov. 1977
Jan. 1978 52 p refs Prepared for DOE
(Contract NAS8-32255)
(NASA-CR-150560) Avail: NTIS HC A04/MF A01 CSCL 10A

Noncorrosive fluid subsystem is being developed that is compatible with closed-loop solar heating and combined heating and hot water systems. The system is also to be compatible with both metallic and nonmetallic plumbing systems, and any combination of these. At least 100 gallons of each type of fluid recommended by the contractor will be delivered. Author

N78-20607*# IBM Federal Systems Div., Huntsville, Ala.
SUBSYSTEM DESIGN PACKAGE FOR THE ON-SITE MONITOR AT SOLAR HEATING AND COOLING SITES
Nov. 1977 19 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150578) Avail: NTIS HC A02/MF A01 CSCL 10A

The on-site monitor is a portable device which can be easily connected to a Site Data Acquisition Subsystem to allow readouts of realtime sensor data in voltage or engineering units at instrumented solar heating and cooling sites. The design package consists of the performance specification, performance requirements cross reference, and the acceptance test procedure. Author

N78-20608*# IBM Federal Systems Div., Huntsville, Ala.
SITE DATA ACQUISITION SUBSYSTEM (SDAS) MOD 1, INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
29 Oct. 1977 27 p
(Contract NAS8-32036)
(NASA-CR-150579; IBM-Rept-7933250) Avail: NTIS

HC A03/MF A01 CSCL 10A

The Site Data Acquisition Subsystem (SDAS) Mod 1 was designed to collect sensor measurement data from solar energy demonstration site. This report provides a brief description of the SDAS and defines the installation requirements and procedures, the operations description and the procedures for field maintenance of the subsystem. Author

N78-20609*# IBM Federal Systems Div., Huntsville, Ala.
SUBSYSTEM DESIGN PACKAGE FOR MOD 2 SITE DATA ACQUISITION SYSTEM: SOLAR HEATING AND COOLING
Sep. 1977 31 p Prepared for DOE
(Contract NAS8-32269)
(NASA-CR-150588) Avail: NTIS HC A03/MF A01 CSCL 10A

The Mod 2 Site Data Acquisition Subsystem (SDAS) is designed to collect data from sensors located on residential or commercial buildings using a solar heating and/or cooling system. The SDAS takes the data obtained from sensors located on the solar heating and/or cooling system, processes the data into a suitable format, stores the data for a period of time, and provides the capability for both telephone retrieval by the Central Data Processing System (CDPS) and manual retrieval of the data for transfer to the central site. The unit is designed so it will not degrade the operation of the solar heating/cooling system which it is monitoring. Author

N78-20610*# Solar Engineering and Equipment Co., Metairie, La.
QUARTERLY AND MONTHLY REPORTS FOR SOLAR HEATING AND COOLING SYSTEMS Progress Report, 30 Sep. 1976 - 30 Sep. 1977
Oct. 1977 29 p Prepared for DOE
(Contract NAS8-32247)
(NASA-CR-150589) Avail: NTIS HC A03/MF A01 CSCL 10A

Two prototype solar heating systems, consisting of the following subsystems: collector, control, and storage, are being developed; research progress is discussed. Author

N78-20611*# IBM Federal Systems Div., Huntsville, Ala.
DESIGN REVIEW PACKAGE FOR THE ON-SITE MONITOR FOR SOLAR HEATING AND COOLING SYSTEMS
Jan. 1977 10 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150590) Avail: NTIS HC A02/MF A01 CSCL 10A

The performance specification and verification matrix for the on-site monitor (OSM) is presented. The OSM is a portable device which, when connected to the Site Data Acquisition Subsystem, allows readout of data on solar heating and cooling operational test sites. Author

N78-20612*# Solafern Ltd., Bourne, Mass.
PROTOTYPE SOLAR HEATING AND HOT WATER SYSTEMS Quarterly Report, 7 Oct. 1976 - 28 Jan. 1977
Jan. 1977 27 p refs Prepared for DOE
(Contract NAS8-32246)
(NASA-CR-150592) Avail: NTIS HC A03/MF A01 CSCL 10A

Alternative approaches to solar heating and hot water system configurations were studied, parametizing the number and location of the dampers, the number and location of the fans, the interface locations with the furnace, the size and type of subsystems, and operating modes. A two-pass air-heating collector was selected based on efficiency and ease of installation. Also, an energy transport module was designed to compactly contain all the mechanical and electrical control components. System performance calculations were carried out over a heating season for the tentative site location at Tunkhnana, Pa. Results illustrate the effect of collector size, storage capacity, and use of a reflector. Factors which affected system performance include site location, insulative quality of the house, and of the system components. A preliminary system performance specification is given. J.M.S.

N78-20613*# Solar Control Corp., Boulder, Colo.
MODULAR CONTROL SUBSYSTEMS FOR USE IN SOLAR HEATING SYSTEMS FOR MULTI-FAMILY DWELLINGS Quarterly Report, 15 Oct. 1976 - 15 Jan. 1977
Jan. 1977 9 p Prepared for DOE
(Contract NAS8-32258)
(NASA-CR-150593) Avail: NTIS HC A02/MF A01 CSCL 10A

Progress in the development of solar heating modular control subsystems is reported. Circuit design, circuit drawings, and printed circuit board layout are discussed along with maintenance manuals, installation instructions, and verification and acceptance tests. Calculations made to determine the predicted performance of the differential thermostat are given including details and results of tests for the offset temperature, and boil and freeze protect points. J.M.S.

N78-20614*# CALMAC Mfg. Co., Englewood, N. J.
LIQUID FLAT PLATE COLLECTOR AND PUMP FOR SOLAR HEATING AND COOLING SYSTEMS: A COLLECTION OF QUARTERLY REPORTS Contractor Report, Oct. 1976 - Oct. 1977
Jan. 1978 27 p Prepared for DOE
(Contract NAS8-32253)
(NASA-CR-150599) Avail: NTIS HC A03/MF A01 CSCL 10A

Progress in the development, fabrication, and delivery of solar subsystems consisting of a solar operated pump, and solar collectors which can be used in solar heating and cooling, or hot water, for single family, multifamily, or commercial applications is reported. Author

N78-20615*# Contemporary Systems, Inc., Jaffrey, N. H.
DESIGN DATA BROCHURE FOR CSI SERIES V SOLAR HEATING SYSTEM
Jan. 1978 29 p Prepared for DOE
(Contract NAS8-32243)
(NASA-CR-150600) Avail: NTIS HC A03/MF A01 CSCL 10A

Generalized information on system configuration, system sizing, and mechanical layout is presented to assist the architect or designer in preparing construction drawings and specifications for the installation of the CSI integrated solar heating systems. Efficiency in space utilization of a full length collector and the importance of proper sizing of the collector array are among the topics discussed. Details of storage and transport subsystems are provided along with drawings and specifications of all components of the CSI system. J.M.S.

N78-20616*# Life Sciences Engineering, Morrison, Colo.
PRELIMINARY DESIGN REVIEW PACKAGE ON AIR FLAT PLATE COLLECTOR FOR SOLAR HEATING AND COOLING SYSTEM
Jan. 1977 54 p refs Prepared for DOE
(Contract NAS8-32261)
(NASA-CR-150601) Avail: NTIS HC A04/MF A01 CSCL 10A

Guidelines to be used in the development and fabrication of a prototype air flat plate collector subsystem containing 320 square feet (10-4 ft x 8 ft panels) of collector area are presented. Topics discussed include: (1) verification plan; (2) thermal analysis; (3) safety hazard analysis; (4) drawing list; (5) special handling, installation and maintenance tools; (6) structural analysis; and (7) selected drawings. Author

N78-20617*# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
PUMP/CONTROL SYSTEM MINIMUM OPERATING COST TESTING
7 Dec. 1977 72 p refs
(Contract NAS8-31564)
(NASA-CR-150604) Avail: NTIS HC A04/MF A01 CSCL 10A

A preliminary evaluation of pump performance was initiated to determine the efficiencies of an arbitrary group of small pumps. Trends in factors affecting energy usage in typical prime movers which might be used in liquid transport solar systems were assessed. Comparisons of centrifugal pump efficiencies were

made from one manufacturer to another. Tests were also made on two positive-displacement pumps and comparisons with centrifugal pumps were observed. Author

N78-20618*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE GOLDSTONE ENERGY PROJECT Final Report
K. P. Bartos 15 Feb. 1978 50 p refs
(Contract NAS7-100)
(NASA-CR-156133; JPL-Pub-78-5) Avail: NTIS HC A03/MF A01 CSCL 10B

The Golstone Energy Project was established in 1974 to investigate ways in which the Goldstone Deep Space Complex in California could be made partly or completely energy-sufficient, especially through the use of solar- and wind-derived energy resources. Ways in which energy could be conserved at the Complex were also studied. Findings included data on both wind and solar energy. Obstacles to demonstrating energy self-sufficiency are: (1) operation and maintenance costs of solar energy systems are estimated to be much higher than conventional energy systems, (2) initial capital costs of present-day technology solar collectors are high and are compounded by low collector efficiency, and (3) no significant market force exists to create the necessary industry to reduce costs through mass production and broad open-market competition. Author

N78-20619*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLAR ENERGY FOR PROCESS HEAT: DESIGN/COST STUDIES OF FOUR INDUSTRIAL RETROFIT APPLICATIONS
R. L. French and Ralph E. Bartera 1 Apr. 1978 62 p refs
(Contract NAS7-100)
(NASA-CR-156139; JPL-Pub-78-25) Avail: NTIS HC A04/MF A01 CSCL 10A

Five specific California plants with potentially attractive solar applications were identified in a process heat survey. These five plants were visited, process requirements evaluated, and conceptual solar system designs were generated. Four DOE (ERDA) sponsored solar energy system demonstration projects were also reviewed and compared to the design/cost cases included in this report. In four of the five cases investigated, retrofit installations providing significant amounts of thermal energy were found to be feasible. The fifth was rejected because of the condition of the building involved, but the process (soap making) appears to be an attractive potential solar application. Costs, however, tend to be high. Several potential areas for cost reduction were identified including larger collector modules and higher duty cycles. Author

N78-20620*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MULTI-WIRE SLURRY WAFERING DEMONSTRATIONS
C. P. Chen 22 Feb. 1978 95 p refs Prepared for DOE
(Contract NAS7-100)
(JPL-Pub-78-37; NASA-CR-156134) Avail: NTIS HC A05/MF A01 CSCL 10A

Ten slicing demonstrations on a multi-wire slurry saw, made to evaluate the silicon ingot wafering capabilities, reveal that the present sawing capabilities can provide usable wafer area from an ingot 1.05m/kg (e.g. kerf width 0.135 mm and wafer thickness 0.265 mm). Satisfactory surface qualities and excellent yield of silicon wafers were found. One drawback is that the add-on cost of producing water from this saw, as presently used, is considerably higher than other systems being developed for the low-cost silicon solar array project (LSSA), primarily because the saw uses a large quantity of wire. The add-on cost can be significantly reduced by extending the wire life and/or by rescue of properly plated wire to restore the diameter. Author

N78-20621*# Rocketdyne, Canoga Park, Calif.
HYDROGEN TURBINE POWER CONVERSION SYSTEM ASSESSMENT Final Report, Aug. 1973 - Apr. 1976
D. E. Wright, A. D. Lucci, J. Campbell, and J. C. Lee 19 Apr. 1978 155 p refs
(Contract NAS3-20388)
(NASA-CR-135298; RI/RD77-252) Avail: NTIS HC A08/MF A01 CSCL 10A

A three part technical study was conducted whereby parametric technical and economic feasibility data were developed on several power conversion systems suitable for the generation of central station electric power through the combustion of hydrogen and the use of the resulting heat energy in turbogenerator equipment. The study assessed potential applications of hydrogen-fueled power conversion systems and identified the three most promising candidates: (1) Ericsson Cycle, (2) gas turbine, and (3) direct steam injection system for fossil fuel as well as nuclear powerplants. A technical and economic evaluation was performed on the three systems from which the direct injection system (fossil fuel only) was selected for a preliminary conceptual design of an integrated hydrogen-fired power conversion system. Author

N78-20622*# IBM Federal Systems Div., Huntsville, Ala.
SYSTEM DESIGN PACKAGE FOR THE SOLAR HEATING AND COOLING CENTRAL DATA PROCESSING SYSTEM
Mar. 1978 350 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150595) Avail: NTIS HC A15/MF A01 CSCL 10A

The central data processing system provides the resources required to assess the performance of solar heating and cooling systems installed at remote sites. These sites consist of residential, commercial, government, and educational types of buildings, and the solar heating and cooling systems can be hot-water, space heating, cooling, and combinations of these. The instrumentation data associated with these systems will vary according to the application and must be collected, processed, and presented in a form which supports continuity of performance evaluation across all applications. Overall software system requirements were established for use in the central integration facility which transforms raw data collected at remote sites into performance evaluation information for assessing the performance of solar heating and cooling systems. Author

N78-20623# Defence Research Establishment, Ottawa. (Ontario).
EVALUATION OF A RESERVE-PRIMARY ZINC/AIR BATTERY TO POWER THE AN/TRN-30 BEACON
William A. Armstrong and Walter J. Moroz Aug. 1977 40 p refs
(AD-A044315; DREO-TN-77-17) Avail: NTIS HC A03/MF A01 CSCL 10/3

Despite problems with leakage of electrolyte, disintegration of the separator material and air starvation at the cathodes, batteries gave four hours of discharge at 3A, while maintaining the battery voltage between 20-30V at temperatures between -40 and 49 C. Suggestions were made for improvements in the battery design. Author (GRA)

N78-20624# Defence Research Establishment, Ottawa. (Ontario).
THE AIRI FUSION CAST LEAD CHLORIDE. PART 1: PRELIMINARY EVALUATION OF SUITABILITY AS CATHODE IN SONOBUOY BATTERIES
George J. Donaldson and John R. Coleman Jul. 1977 36 p refs
(AD-A043635; DREO-TN-77-16-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 10/3

The fusion-cast flexible lead chloride material produced by the AIRI process has been subjected to a preliminary examination to test its suitability in sonobuoy battery applications. The material is capable of providing electrical performance in excess of the specifications given for a nominal three hour sonobuoy battery. Rapid activation can be achieved by selecting cathode material in which the lead chloride deposit is sufficiently uniform and light so that the copper gauze electronic conductor remains exposed at the electrode surface. The pulse discharge performance has been briefly examined and the material appears to be capable of pulsed current discharge without excessive voltage loss. Further evaluation remains to be done both on the passive and active sonobuoy battery applications for this electrode. Author (GRA)

N78-20625# General Accounting Office, Washington, D. C. Energy and Minerals Div.
MORE ATTENTION SHOULD BE PAID TO MAKING THE U.S. LESS VULNERABLE TO FOREIGN OIL PRICE AND SUPPLY DECISIONS
3 Jan. 1978 107 p
(PB-275309/3; EMD-78-24) Avail: NTIS HC A06/MF A01 CSCL 10A

Initiatives to make the supply of imported oil less subject to disruptions and price increases are presented. Author (GRA)

N78-20626# Little (Arthur D.), Inc., Cambridge, Mass.
ENERGY CONTINGENCY PLANNING Final Report
1977 390 p Sponsored by Pacific Northwest Regional Commission, Vancouver, Wash.
(PB-275371/3; NEPP-IV) Avail: NTIS HC A17/MF A01 CSCL 10A

Issues associated with the supply of electricity, natural gas, and petroleum were discussed along with the legal and administrative environment within which energy contingency planning can be performed. Technical aspects of action plans or contingency measures were considered and energy shortage measurement and triggering issues were examined. GRA

N78-20627# General Accounting Office, Washington, D. C. Energy and Mineral Div.
EVALUATION OF THE PLAN TO CONSERVE ENERGY IN FEDERAL BUILDINGS THROUGH RETROFIT PROGRAMS
22 Dec. 1977 16 p
(PB-275311/9; EMD-78-2) Avail: NTIS HC A02/MF A01 CSCL 13A

Since the government owns over 400,000 buildings which consume about 753 trillion Btu of energy annually, retrofitting as a cornerstone of energy management in federal buildings is compelling. The department of energy proposes to require that each federal agency owning or operating buildings: reduce energy consumption in existing buildings by 20 percent compared to 1975 consumption; perform retrofit surveys on all federally owned buildings by the end of fiscal year 1981; establish formal operating and maintenance guidelines for energy conservation and management; prepare a 10-year plan which covers retrofitting existing buildings; submit data on its buildings and energy use with their plans, to be updated annually. GRA

N78-20628# Pennsylvania State Univ., University Park. Applied Research Lab.
HIGH-TEMPERTURE LINEAR RADIATION-CAVITY SOLAR COLLECTOR WITH A FRESNEL CONCENTRATOR Ph.D. Thesis
Zenen I. Antoniak 8 Dec. 1977 236 p refs
(Contract N00017-73-C-1418)
(AD-A049982; TM-77-326) Avail: NTIS HC A11/MF A01 CSCL 10/2

A model solar-thermal concentrator-collector that is 1/6th scale (in cross section) relative to a system considered to be of practical dimensions for power generation has been constructed and tested. It consists of an Archimedes (i.e., Fresnel) mirror-concentrator, 5 cm ID x 1.5 m long glass receiver pipe, 0.3 cm thick graphite absorber, and gaseous (Ar) heat transfer medium. On clear days (direct solar flux ca. 800 W/sq.m.), stagnation (i.e., no-flow condition) temperatures of ca. 370 C have been reached at the center of the experimental device, where end effects are minimal. Experiments have been performed with gas flow rates up to ca. 100 liters/min (200 RE 2000), resulting in a bulk fluid temperature rise in the axial (flow) direction of up to 285 C. These experiments have been utilized in a study of heat transfer processes within the collector. A computer model of this system which takes into account most of the influential variables (e.g., combined forced-free convection, establishment of velocity and temperature profiles, and axial heat conduction) has been developed. Its behavior agrees well with observations. Also, after ca. 200 h of high-temperature operation, materials degradation was measured and found to be very low. GRA

N78-20629# Pennsylvania Univ., Philadelphia. Dept. of Metallurgy and Materials Science.
HIGH ENERGY-DENSITY ELECTRODES FOR ALKALI-METAL BATTERY SYSTEMS Final Report, 1 Apr. - 31 Jul. 1977
Wayne L. Worrell, Samar Basu, and Alan Nagelberg 29 Nov. 1977 26 p refs
(Grant AF-AFOSR-3319-77; ARPA Order 3019)
(AD-A050342; AFOSR-78-0053TR) Avail: NTIS HC A03/MF A01 CSCL 10/3

One major impediment in the development of new alkali-metal battery systems with high energy density is the lack of suitable electrode materials. Dichalcogenides of the Group IV and V transition metals intercalated with lithium or sodium offer exciting possibilities as novel high energy-density electrodes. GRA

N78-20630# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla.
A SURVEY OF CONSIDERATIONS FOR SOLAR ENERGY FACILITY APPLICATIONS Final Report, Mar. 1977
Marshall W. Nay, Jr. Dec. 1977 65 p refs
(AD-A049490; CEEDO-TR-77-39) Avail: NTIS HC A04/MF A01 CSCL 13/1

The purpose of this report is to provide Air Force civil engineers some useful information for the planning and programming of solar energy systems to satisfy facility energy requirements. This report has been prepared in response to the belief that considerable interest in solar energy system technology, as well as other alternate energy schemes, is increasing at a rapid pace in the Air Force. A considerable effort is devoted to appraising the current status of fossil fuel energy resources in order to establish the need for expanded work in developing solar energy technology. The current and potential areas of application of solar energy technology are described with special attention devoted to space heating. Additionally, environmental considerations of solar energy technology are described along with the current Air Force solar energy program. This report concludes with some suggestions for establishing a solar energy program on an individual or installation basis. Author (GRA)

N78-20631# Defence Research Establishment, Ottawa. (Ontario). Electrical Power Sources Div.
NICKEL/CADMIUM AIRCRAFT BATTERIES: BATTERY ALARM UNIT
K. Feldman and R. M. Hayashi Apr. 1977 19 p refs
(AD-A039521; DREO-TN-77-7) Avail: NTIS HC A02/MF A01 CSCL 10/3

Malfunctions in nickel/cadmium aircraft batteries which may lead to dangerous thermal problems are usually preceded by small atypical decreases in voltage of a single failing cell. Early detection of this decrease can provide time for suitable measures to be taken before other cells are damaged and catastrophic consequences occur. Also detection during battery shop operations can facilitate the screening out of defective cells. The battery alarm unit described in this paper was developed at DREO and is a simple device which monitors the cell voltages by comparing the voltage in one half of the battery with that of the other half. Only three connections to the battery are required. Atypical voltage changes in a single cell, of the order of 50 mV may be detected. The precise sensitivity may be varied by varying resistor values in the input network. The instrument has been found useful in the battery shop both for warning of failing cells in batteries being charged and for attracting attention to cells which show low capacity while being discharged. Presumably the instrument could be equally useful as an early warning device on aircraft. For such applications consideration must be given to questions of procedure, configuration and airworthy mechanical design. Also experience in the field is required on which to base decisions on the optimum sensitivity and whether aircraft and battery shop applications require the same sensitivities. Author (GRA)

N78-20632# Defence Research Establishment, Ottawa. (Ontario). Electrical Power Sources Div.
NICKEL/CADMIUM AIRCRAFT BATTERIES: RAPID ELECTROLYTE EXCHANGE TECHNIQUE
K. Feldman and R. M. Hayashi Apr. 1977 15 p refs
(AD-A039335; DREO-TN-77-8) Avail: NTIS HC A02/MF A01 CSCL 10/3

The potassium hydroxide electrolyte in nickel/cadmium aircraft batteries may become increasingly more contaminated by carbonate with battery use. When the carbonate concentration exceeds certain limits it is advisable to exchange the electrolyte. However, most of the electrolyte in a cell is soaked into the separator materials and plate pores, and is held in the pack, so only a small portion of it may be poured out. Repeated removal and replacement of these small amounts can accomplish the desired exchange if the clean added electrolyte is adequately mixed with the contaminated electrolyte each time. In the

normal procedures, mixing is accomplished by discharging and recharging the battery after each small exchange and hence is very time consuming. This paper discusses the various factors involved and presents a vacuum technique for mixing the added with the retained electrolyte in each cell. The method presented reduces the time required for the above operation from a week or more to a day or two. Author (GRA)

N78-20633# Defence Research Establishment, Ottawa. (Ontario).
SEPARATOR MATERIAL FOR RESERVE-PRIMARY ZINC/AIR BATTERIES
William A. Armstrong and James A. Wheat Mar. 1977 23 p refs
(AD-A037588; DREO-R-756) Avail: NTIS HC A02/MF A01 CSCL 10/3

It has been found that separator materials commonly used in zinc/air batteries do not wet readily when placed in contact with alkaline electrolyte at -40 C. They are, therefore, unsuitable for use in a reserve-primary zinc/air battery which must be capable of rapid activation and operation at any temperature in the range -40 C to 50 C. A glass-Vinyon separator which meets the requirements of this type of battery has been developed. Author (GRA)

N78-20634# Defence Research Establishment, Ottawa. (Ontario). Electrical Power Sources Div.
THE CYCLIC VOLTAMMETRY OF LEAD AND LEAD-ANTIMONY BATTERY GRID ALLOY IN AQUEOUS SULPHURIC ACID AT 25 TO -40 DEG C
T. Godfrey Chang, Maurice M. Wright, and Eugene M. L. Valeriote Feb. 1977 35 p refs
(AD-A036290; DREO-R-753) Avail: NTIS HC A03/MF A01 CSCL 10/3

The cyclic voltammetry of lead and antimonial lead has been studied in 1.25 S.G. H2SO4, at 25 C to -40 C, at sweep rates of 0.42 to 42 mV/S, between hydrogen and oxygen evolution and over narrower regions of potential. The latter, coupled with systematic variation of the positive or negative reversal potential, has revealed peak shifting and hysteresis effects which give further insight into the nature of the reactions of the lead-acid battery. The significance of the results to the improvement of charge acceptance at low temperatures is discussed. Author (GRA)

N78-20635# Defence Research Establishment, Ottawa. (Ontario). Electrical Power Sources Div.
NICKEL/CADMIUM AIRCRAFT BATTERIES: SINGLE SENSOR TEMPERATURE MONITORING
Keiva Feldman and Robert M. Hayashi Mar. 1977 12 p refs
(AD-A037722; DREO-TN-77-3) Avail: NTIS HC A02/MF A01 CSCL 10/3

Most of the failures of nickel/cadmium batteries in aircraft are triggered by the development of a short circuit in a single cell in the battery. An experiment was conducted to determine whether the use of a single temperature sensor on an intercell link would be adequate to warn of a short circuit in a cell located elsewhere in the battery. The results indicate that this would not be adequate. GRA

N78-20636# Defence Research Establishment, Ottawa. (Ontario).
NICKEL/CADMIUM AIRCRAFT BATTERIES: MULTICHANNEL GASSING-RATE METER
Keiva Feldman and Ronald L. Haines Mar. 1977 24 p ref
(AD-A039735; DREO-TN-77-5) Avail: NTIS HC A02/MF A01 CSCL 10/3

The instrument described is used to assess the state of health of separators in nickel/cadmium aircraft batteries and thus to permit removal from service of those cells which may be expected to fail catastrophically in the near future. Twenty channels are provided to permit simultaneous observation of all cells in a complete battery. Each channel measures the rate of emission of gas from one cell during overcharge by means of the pressure build up in a chamber from which the gas escapes via a suitable orifice. Construction, calibration, and cleaning are discussed. Author (GRA)

N78-20637# California Univ., Livermore. Lawrence Livermore Lab.
FLYWHEEL-BATTERY HYBRID POWER SYSTEM: A CONCEPT TO IMPROVE ELECTRIC VEHICLE PERFORMANCE
D. D. Davis and R. C. Epps 28 Jan. 1977 42 p refs Presented at 4th Intern. Symp. on Automotive Propulsion Systems, Arlington, Va., 17-22 Apr. 1977
(Contract W-7405-eng-48)
(UCRL-79154; Conf-770430-20) Avail: NTIS HC A03/MF A01

A high-energy composite flywheel was coupled to a simple, efficient, electro-mechanical transmission. Lead-acid as well as near-term and advanced battery types were examined as prime power sources. Interactive control of battery and/or flywheel drive power was provided by a versatile microprocessor-based power control unit. The flywheel augmented the battery during periods of high power demand: starting, acceleration, and hill climbing. With battery power demand stabilized at a low value, specific energy was maintained near maximum and resulted in increased vehicle range. Vehicle kinetic energy was restored to the flywheel when traveling downhill or during any period of deceleration. The flywheel-battery hybrid was thus able to make efficient use of a regenerative braking system to recover energy. ERA

N78-20638# Holt (Ben) Co., Pasadena, Calif.
GEOTHERMAL DIRECT CONTACT HEAT EXCHANGE Final Report
A. V. Sims 10 Jun. 1977 115 p refs
(Contract EY-76-C-03-1116)
(SAN/1116-1) Avail: NTIS HC A06/MF A01

A glass direct contact heat exchange column was operated in the laboratory. The column was operated at atmospheric pressure using hot water and normal hexane. Column internals testing included an empty column, sieve trays, disk-and-doughnut trays, and two types of packing. Operation was very smooth in all cases and the minimum temperature approaches varied from less than 1 C for packing to 13 C for the empty column. High heat transfer rates were obtained in all cases, however, columns should be sized on the basis of liquid and vapor traffic. The solubilities of hydrocarbons were determined for normal hexane, pentane and butane in water and sodium chloride and calcium chloride brines at various temperatures. A computer program was used to study the effect of operating variables on the thermodynamic cycle efficiencies. A preliminary design for a 50 MWe plant was prepared and plant capital cost and operating cost were estimated. ERA

N78-20639# Honeywell, Inc., Minneapolis, Minn. Energy Resources Center.
LOW-COST SOLAR AIR HEATER Semiannual Progress Report, 29 Jun. - 22 Dec. 1976
D. R. Rask and L. J. Mueller 22 Dec. 1977 89 p refs
(Contract EY-76-C-02-2929)
(COO-2929-6) Avail: NTIS HC A05/MF A01

A jet impingement concept was used as the absorber plate-to-air stream heat transfer mechanism. For comparison purposes, a baseline parallel plate collector was analyzed, fabricated and tested. Values for the average jet heat transfer coefficient were predicted. A computer simulation using a nodal network collector model was used to predict collector performance. The collector mechanical design effort involved a study of cost effective methods for assembly and material selection. A preliminary recommended design is presented. ERA

N78-20640# Maryland Univ., College Park. Dept. of Mechanical Engineering.
SOLAR POWERED ABSORPTION AIR-CONDITIONING SYSTEM PERFORMANCE PREDICTIONS USING STOCHASTIC WEATHER MODELS
D. K. Anand, R. W. Allen, and E. O. Bazques Sep. 1977 123 p refs
(Contract EY-76-S-05-4976)
(ORO-4976-77/1) Avail: NTIS HC A06/MF A01

Synthetic data was derived using weather history and represented by a joint probability density matrix and at most six constants. Total insolation and the system coefficient of performance using real data and synthetic data were compared. Long term monthly and cooling season predictions based on synthetic data for both air-cooled and water-cooled systems are

quite good. It is concluded that the use of synthetic data allows very inexpensive simulation and yields satisfactory results for design purposes. ERA

N78-20641# Oak Ridge National Lab., Tenn. Solid State Div.
SOLAR CELLS FROM ION-IMPLANTED, LASER-ANNEALED SILICON
J. W. Cleland, J. Narayan, R. D. Westbrook, C. W. White, and R. T. Young Sep. 1977 9 p refs Presented at the ERDA Photovoltaics Advan. Mater. Rev. Meeting, Denver, 4 Oct. 1977
(Contract W-7405-eng-26)
(CONF-771051) Avail: NTIS HC A02/MF A01

Laser annealing of the lattice damage introduced by ion implantation of boron into silicon was explored. The electrical properties of boron implanted silicon annealed by high power Q-switched ruby laser radiation were compared with similar properties obtained on ion implanted thermally annealed samples. The defect structure of the implanted layer before and after both laser and thermal annealing was studied by X ray, microscopy, transmission electron microscopy, ion channeling and secondary ion mass spectroscopy. Solar cells were fabricated using ion implantation-laser annealing, ion implantation-thermal annealing, and conventional thermal diffusion techniques for p-n junction formation. Results are presented and dicussed. ERA

N78-20642# Oak Ridge National Lab., Tenn. Solid State Div.
LASER ANNEALED BORON IMPLANTED SILICON SOLAR CELLS
R. T. Young, C. W. White, G. J. Clark, J. Narayan, R. D. Westbrook, and W. H. Christie Sep. 1977 10 p refs Presented at the Photovoltaics Solar Energy Conf., Luxembourg, 27 Sep. 1977
(Contract W-7405-eng-26)
(CONF-770922-2) Avail: NTIS HC A02/MF A01

Extensive studies were carried out to compare laser and conventional thermal annealing characteristics using B+ (35 keV) implanted silicon (100) crystals. Results show that laser annealing can completely restore electrical activity in the implanted layer with little or no degradation of the minority carrier lifetime in the substrate. Moreover, the residual disorder in the implanted layer is drastically reduced in comparison to that observed after conventional thermal annealing. Solar cells were fabricated using B+ (35 keV) implanted, laser annealed, 80 OHM-cm (100) Si. A substantial improvement in cell parameters was observed in laser annealed cells compared to similar cells fabricated using conventional thermal annealing. Results are presented to compare laser and thermally annealed ion implanted cells, and to compare these to cells fabricated using standard diffusion techniques. ERA

N78-20643# Little (Arthur D.), Inc., Cambridge, Mass.
EVALUATION OF A SEAFLOOR NUCLEAR POWER SUPPLY AND ITS POTENTIAL APPLICATIONS Final Report
30 Apr. 1977 94 p refs
(Contract EY-76-C-02-4123)
(COO-4123-1) Avail: NTIS HC A05/MF A01

The seafloor nuclear power supply concept was proposed as a source of electrical energy for subsea pumping of petroleum products. It consisted of a small nuclear reactor, moderated by zirconium hydride (ZrH) and cooled by liquid metal (NaK), which drove a 3-MW turbine/generator system which used toluene as the working fluid. It was determined that the concept was technically feasible, with regard to the nuclear, marine, electrical, and petroleum engineering aspects. Fuel in the form of gas from the wells was available at near-zero cost in almost all cases of field development, so that operating expenses were minimal. Alternating-current systems were preferred at distances less than 20 miles; direct current was more economical at greater distances. ERA

N78-20644# Sandia Labs., Albuquerque, N. Mex. Solar Total Energy Program Div.
METHODOLOGY FOR SITE SELECTION OF A SOLAR TOTAL ENERGY LARGE SCALE EXPERIMENT
Robert W. Hunke Mar. 1977 19 p refs
(Contract EY-76-C-04-0789)
(SAND-77-0248) Avail: NTIS HC A02/MF A01

The development of the evaluation criteria for a site, a parcel of real property with a development - apparatus, equipment, facilities, etc. is described. The large scale experiment's desired characteristics are described, and the evaluation criteria are given together with an algorithm for the calculation of the expected value of proposals. ERA

N78-20645# General Atomic Co., San Diego, Calif.
HTS THERMAL STORAGE PEAKING PLANT
D. L. Vrable and R. N. Quade Apr. 1977 139 p refs
(Contract W-7405-eng-26)
(ORNL-Sub-4188-2; GA-A-14160) Avail: NTIS HC A07/MF A01

Use of the high temperature gas cooled reactor to generate intermediate load and peak power by using heat transfer salt thermal storage was evaluated. Technical and economic aspects of the conceptual design were investigated to confirm the system's viability for this application. Using a reference thermal power level of 2000 MW(t), preliminary system analysis was performed and a selection of the system configuration was completed. The reference point design served as a basis for evaluating the technical and economic aspects of the system. Conceptual design data are provided for the major plant components. Preliminary cost estimates for the plant design and power costs were performed for the selected reference design. ERA

N78-20646# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
FLOATING POWER OPTIMIZATION STUDIES FOR THE COOLING SYSTEM OF A GEOTHERMAL POWER PLANT
C. J. Shaffer Aug. 1977 94 p refs
(Contract EY-76-C-07-1570)
(TREE-1164) Avail: NTIS HC A05/MF A01

The floating power concept was studied for a geothermal power plant as a method of increasing the plant efficiency and decreasing the cost of geothermal power. The stored cooling concept was studied as a method of reducing the power fluctuations of the floating power concept. Parametric and optimization studies were conducted for a variety of different types of cooling systems including wet and dry cooling towers, direct and indirect cooling systems, forced and natural draft cooling towers, and cooling ponds. An indirect forced draft wet cooling tower cooling system was used as a base case design for comparison purposes. ERA

N78-20647# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
QUALIFICATION OF SAFT VR-6-S AND SAFT VO-7-S NiCd CELL COVERS Final Report
W. J. VanderVet Paris ESA 27 Jun. 1977 97 p
(Contract ESTEC-2314/74)
(NLR-TR-77069-C; ESA-CR(P)-1024) Avail: NTIS HC A05/MF A01

Results of qualification tests are reported for SAFT VR 6-S and SAFT VO 7-S NiCd cell covers for long duration space use. Two failure modes were considered: loss of hermeticity and loss of insulation between cover and lead-throughs. ESA

N78-20648# Illinois Dept. of Business and Economic Development, Springfield. Div. of Energy.
THE ILLINOIS PROGRAM FOR COMPREHENSIVE SOLAR ENERGY LEGISLATION
Bruce D. Green, David Z. Pogany, and J. Ernest Dunwoody Jun. 1977 42 p refs Prepared in cooperation with Ill. Inst. Environ. Quality, Chicago
(PB-275565; ILLDOE-77/08) Avail: NTIS HC A03/MF A01 CSCL 10A

The development of a Solar Energy Program in Illinois, including the formulation of the Comprehensive Solar Energy Act of 1977 is examined. A discussion of the need for comprehensive legislation precedes the overview of dynamics. GRA

N78-20649# National Materials Advisory Board, Washington, D. C.
EROSION CONTROL IN ENERGY SYSTEMS Final Report
Nov. 1977 243 p refs
(Contract EX-76-C-01-2112)

(PB-275105; NMAB-334) Avail: NTIS HC A11/MF A01 CSCL 11F

The report of the findings of a Committee looking at erosion problems in energy systems: identifies the erosion conditions inherent in energy systems and categorizes them according to severity; describes the interplay between design and materials; describes the mechanisms of erosion and corrosion, and their combined effects; emphasizes the importance of test evaluation procedures; and summarizes government sponsored work in progress. The conclusions reached led to twelve recommendations aimed at advancing erosion/corrosion technology. These recommendations emphasize long range planning; development of a fundamental understanding of the erosion/corrosion process; development of erosion/corrosion models and meaningful correlations; development of testing procedures for material response investigations, engineering data and accelerated life tests; and design considerations. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N78-20650 Arizona Univ., Tucson.
THE DESIGN AND APPLICATION OF A POLAR NEPHELOMETER FOR AEROSOL STUDIES Ph.D. Thesis
Mark Zabel Hansen 1977 117 p
Avail: Univ. Microfilms Order No. 78-02078

The nephelometer has sufficient sensitivity to detect molecular scatter from air. This allows the instrument to measure very clean air scatter and to use pure molecular scatter from calibration. A relatively compact system is achieved by using a folded light path with an air cooled argon laser for the light source. A small, sensitive detector field of view of + or - 1/4 degree of scatter is used along with a single wavelength of incident light to minimize uncertainties in the scattering theory. The system is automated for data acquisition of the scattering matrix elements over an angular range of 2 deg to 178 deg. scatter. Both laser output and detector sensitivity are monitored to normalize the measured light scatter. Dissert. Abstr.

N78-20651 Southern Methodist Univ., Dallas, Tex.
ENVIRONMENTAL NOISE MEASUREMENT METHODOLOGIES Ph.D. Thesis
Riaz Munir Sheikh 1977 257 p
Avail: Univ. Microfilms Order No. 78-01427

Noise monitoring, an important tool for enforcing noise regulations and for gathering noise data for planning purposes, was studied. A methodology is presented which involves either 24-hour manual, handheld meter sampling for both quantitative and qualitative data or a continuous automatic level sampling for only quantitative data. Analog tape microsampling, permitting both types of data, is the intermittent recording of subsamples of an analog acoustic signal on a magnetic tape. Microsampling takes advantage of the fact that noise levels are highly correlated over short intervals of time, and thus does away with redundant data at the expense of missing some events of low probability of occurrence. Considerable savings in cost of data acquisition and data reduction are accomplished. Also, the cost of equipment needed to collect the data is reduced. Dissert. Abstr.

N78-20652 Virginia Univ., Charlottesville.
IMPLEMENTING COST-EFFECTIVE POLLUTION CONTROL BY MEANS OF EFFLUENT CHARGES: AN EXAMPLE APPLIED TO ELECTROPLATING DISCHARGES Ph.D. Thesis
Edward Richard Saltzberg 1977 205 p
Avail: Univ. Microfilms Order No. 78-00459

The goals of the current Federal pollution control policy can be achieved quickly and inexpensively if a tax is placed on the pollutants discharged. Mathematical models were developed to simulate standard abatement principles and to calculate the marginal abatement costs of individual polluting firms. A data collection format is included in the program to reflect waste management constraints on each firm, and to assess the validity of the marginal cost estimates by comparing calculated pollution loads with the corresponding sampled discharges. An electroplating abatement model is described and used to estimate the marginal abatement cost schedules of three sizes of hypothetical electroplating firms. The nature of the electroplating tax program and the sensitivity of the marginal cost schedule to certain process variables indicate the possibility of designing a national tax policy. Dissert. Abstr.

N78-20653 Harvard Univ., Cambridge, Mass.
SOME ANALYTICAL METHODS APPLIED TO LAKE WATER QUALITY PROBLEMS Ph.D. Thesis
William Wilmot Walker 1977 557 p
Avail: Univ. Microfilms Order No. 7800575

Both empirical and theoretical approaches were taken in examining and modeling the behavior of a cross-section of lakes, as well as the behavior of a single lake in temporal and spatial domains. Data characterizing the phosphorus balances, morphology, and hydrology of 105 northern temperate lakes provided a basis for demonstrating empirical approaches. An error analysis estimates the independent variable, parameter, and model error components of retention coefficient and lake phosphorus concentration predictions. Stepwise discriminant and principal component analyses are employed to develop a model for estimating lake trophic state, expressed in probabilistic terms, from uncertain estimates of phosphorus loading, mean depth, and hydraulic residence time. Dissert. Abstr.

N78-20654*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WATER-VAPOR PRESSURE CONTROL IN A VOLUME
John J. Scialdone Mar. 1978 20 p refs
(NASA-TP-1172; G7802-F6) Avail: NTIS HC A02/MF A01 CSCL 13B

The variation with time of the partial pressure of water in a volume that has openings to the outside environment and includes vapor sources was evaluated as a function of the purging flow and its vapor content. Experimental tests to estimate the diffusion of ambient humidity through openings and to validate calculated results were included. The purging flows required to produce and maintain a certain humidity in shipping containers, storage rooms, and clean rooms can be estimated with the relationship developed here. These purging flows are necessary to prevent the contamination, degradation, and other effects of water vapor on the systems inside these volumes. Author

N78-20655# Olson Labs., Inc., Anaheim, Calif.
DEVELOPMENT OF REVISED LIGHT-DUTY-VEHICLE EMISSION: AVERAGE SPEED RELATIONSHIPS
Malcolm Smith and Tom Aldrich Aug. 1977 252 p refs
(Contract EPA-68-03-2222)
(PB-275763/1; EPA-460/3-77-011) Avail: NTIS HC A12/MF A01 CSCL 21D

The results of light duty vehicle emission average speed relationships are presented. A statistical analysis of chase car data was performed and regressions of fuel consumption and emissions on average speed over driving cycles generated from combined GM and CAPE-10 data were established. Ten cycles were selected at each of 11 nominal speeds ranging from 5 mph to 55 mph. Hot-start estimates of HC, CO, NOx (all in units of miles per gallon) over each of the cycles were obtained for each of 18 model year groups. GRA

N78-20656# Stanford Univ., Calif. Dept. of Civil Engineering.
THE ROLE OF IRON SULFIDES IN CONTROLLING TRACE HEAVY METALS IN ANAEROBIC SEDIMENTS: OXIDATIVE DISSOLUTION OF FERROUS MONOSULFIDES AND THE BEHAVIOR OF ASSOCIATED TRACE METALS Final Report, 5 Dec. 1974 - 4 Dec. 1976
Michael B. Nelson, James A. Davis, III, Mark M. Benjamin, and James O. Leckie Tyndall AFB, Fla. CEEDO Feb. 1977 419 p refs
(Contract F29601-75-C-0028)
(AD-A049712; CEEDO-TR-77-13) Avail: NTIS HC A18/MF A01 CSCL 13/2

The study of the kinetics of oxidation of the ferrous monosulfide mackinawite and the fate of the associated heavy metals are important to a better understanding of the processes and mechanisms controlling the release, transport and retention

of heavy metals in natural aquatic systems. This project undertook a detailed study of several selected aspects of the aqueous chemistry of heavy metals and of the oxidative dissolution of FeS(s) and the fate of associated heavy metals both during and after the oxidation reaction. The material is organized into sections dealing with the basic aqueous chemistry of iron and sulfur, silver, cadmium, adsorption models, experimental methodology, results and discussion. GRA

N78-20657# Foster-Miller Associates, Inc., Waltham, Mass.
DEVELOPMENT OF A SPILLED OIL RECOVERY SEPARATOR FOR USE AS PART OF AN OIL SPILL REMOVAL DEVICE Final Report
Andrew Harvey, William Mack, Richard Stevenson, and Adi Guzdar Oct. 1977 106 p refs
(Grant DOT-CG-53272-A)
(AD-A049711; USCG-D-88-77) Avail: NTIS HC A06/MF A01 CSCL 06/6

This report describes the development of an oil-water separator for use with oil spill clean-up equipment. The development is an extension of technology used previously in designing oil-water separation devices for cleaning bilge and ballast discharge waters. A new design was needed to meet the different flow rate, separation performance, head and suction capability, oil type, and oil inlet concentration requirements. A prototype centrifugal, axial flow separator with a nominal fluid throughput of 100 gpm was developed. This report details the design, fabrication, testing and control of the unit. Author (GRA)

N78-20658# California Univ., Livermore. Lawrence Livermore Lab.
TRANSNATIONAL AIR QUALITY: THE CASE FOR THE STRATOSPHERE
Joseph B. Knox, Marvin H. Dickerson, Rolf Lange, and Kendall R. Peterson Aug. 1977 28 p refs Presented at 8th Intern. Tech. Meeting on Air Pollution Modeling and its Appl., Louvain-La-Neuve, Belguim, 20-23 Sep. 1977
(Contract W-7405-eng-48)
(UCRL-79428; Conf-770934-1) Avail: NTIS HC A03/MF A01

The new Concorde flight corridors will be at approximately the same height as the debris cloud trajectories of recent high yield Chinese weapons tests. The FAA is formulating a concept for a stratospheric environmental assessment capability whose objective is to furnish timely and accurate predictions of in-cabin environmental radiation dose-to-man estimates in the event of future nuclear tests. Modeling elements are illustrated on the high yield Chinese test wherein the debris cloud intersected the North Atlantic flight corridors several days after detonation and resulted in whole-body gamma dose rates of about 1 millirem per hour above background. ERA

N78-20659# Water Research Centre, Stevenage (England).
SIMULTANEOUS MULTI-ELEMENT ANALYSIS OF AQUEOUS SOLUTIONS
Feb. 1977 4 p refs
(WRC-RN-8) Avail: NTIS HC A02/MF A01

Techniques are discussed for the simultaneous multi-element analysis of water samples, in order to determine trace metals. The four techniques surveyed meeting the requirements of multi-element analysis and using standard instrumentation are: spark-source mass spectroscopy, neutron activation analysis, X-ray fluorescence spectrometry, and optical emission spectrometry. ESA

N78-20660# Central Electricity Generating Board, London (England).
PLUME DISPERSION AND SO2 FLUX MEASUREMENTS AT DRAX POWER STATION, ENGLAND
R. H. Varey, R. M. Ellis, P. M. Hamilton, D. J. Moore, and S. Sutton 1977 15 p Presented at the Conf. on Correlation Spectry., Toronto, 16-17 Jun. 1977
Avail: NTIS HC A02/MF A01

A correlation spectrometer was used to measure SO2 burdens at a 200 MW coal fired station at Crax, England. The experiments were part of a CEC exercise in which a total of five correlation spectrometers were used. From the measurements, plume dispersion parameters and SO2 fluxes were calculated. In general there is good agreement between the calculated fluxes and the power station emissions. It is suggested that some anomalously high results could be due to multiple scattering of light in cloud layers. Author (ESA)

N78-20661# GCA Corp., Bedford, Mass. Technology Div.
CHARACTERIZATION OF WASHINGTON, D.C. CARBON MONOXIDE PROBLEM Final Report
Theodore P. Midurski and Victor L. Corbin Oct. 1977 155 p refs
(Contract EPA-68-02-1376)
(PB-275169/1; GCA-TR-77-11-G; EPA-450/3-77-053) Avail: NTIS HC A08/MF A01 CSCL 13B

Relationships between traffic, vehicle emissions, and carbon monoxide (CO) levels within the Washington, D.C. area are analyzed using the revised CO Hot Spot Guidelines and supplementary computer models. A demonstration of the revised CO Hot Spot Guidelines is provided as well as a first level analysis of potential CO problems in the Washington, D.C. area. Levels of analysis described include: (1) areawide screening of all signalized intersections, (2) hot spot verification at 29 selected locations, and (3) comparison of computer modeling results with ambient data. Data requirements and resource needs are identified for each level of analysis. GRA

N78-20662# General Accounting Office, Washington, D. C. Community and Economic Development Div.
NATIONAL WATER QUALITY GOALS CANNOT BE ATTAINED WITHOUT MORE ATTENTION TO POLLUTION FROM DIFFUSED OR NONPOINT SOURCES
20 Dec. 1977 55 p
(PB-275290/5; CED-78-6) Avail: NTIS HC A04/MF A01 CSCL 13B

Water quality goals cannot be achieved in many rivers and lakes because of diffused, or nonpoint, sources of water pollution. Limited controls exist and agencies developing comprehensive control plans under grants from the Environmental Protection Agency lack sufficient resources to gather needed data--a result of past and current emphasis on controlling industrial and municipal point sources of water pollution. GRA

N78-20663# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
PROCEDURES FOR THE PREPARATION OF EMISSION INVENTORIES FOR VOLATILE ORGANIC COMPOUNDS, VOLUME 1
Tom Lahre Dec. 1977 251 p refs
(PB-275292; EPA-450/2-77-028-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 13B

Procedures are described for compiling emission inventories of volatile organic compounds for use in less data-intensive models. The basic inventory elements (planning, data collection, emission estimates, and reporting) are discussed. No single prescriptive methodology is presented but a set of procedures is described so that the agency may choose the most appropriate techniques to meet its needs in its oxidant and other programs. Various examples are included to aid the agency in the understanding and utilization of this document. GRA

N78-20664# New England River Basins Commission, Boston, Mass.
NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION. 1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES Final Report
Nov. 1977 297 p Sponsored in part by US Water Resources Council
(PB-275342/4; NERBC-77; FR-4) Avail: NTIS HC A13/MF A01 CSCL 13B

Conclusions and recommendations developed in response to final list of severe resource problems are presented. Included are: a regional description; a presentation of the problems and proposed approaches to their resolution by problem topic; a comparison of the Federally developed data with that prepared by the region and states; a summary of the major resource problems by geographic area; an analysis of the implications of not resolving the problems; and a chapter presenting New

England's perspective on Federal policies for the planning and management of water and related land resources. GRA

N78-20665# Geophysics Corp. of America, Bedford, Mass. Technology Div.
CHARACTERIZATION OF THE WASHINGTON, D.C. OXIDANT PROBLEM Final Report
Frank A. Record Sep. 1977 269 p refs
(Contract EPA-68-02-1376)
(PB-275458/8; GCA-TR-77-11-G(1); EPA-450/3-77-054)
Avail: NTIS HC A12/MF A01 CSCL 13B

The results of a study to characterize the oxidant problem in the Washington, D. C. metropolitan area are described. Emphasis was placed on ambient monitoring data on ozone, nitrogen oxides and nonmethane hydrocarbon concentrations observed during summer, 1976. Additional data collected during the study and summarized include: surface and upper air meteorological data; aircraft observations of O3, NO, NOx, SO2; and condensation nuclei, and hydrocarbon species data. Both horizontal and vertical ozone profiles obtained during the two weeks of aircraft sampling in and around the Washington, D.C. area are presented. GRA

N78-20666# Stanford Research Inst., Menlo Park, Calif.
USER'S MANUAL FOR THE APRAC-2 EMISSIONS AND DIFFUSION MODEL
F. L. Ludwig, P. B. Simmon, R. C. Sandys, J. C. Bobick, L. R. Seiders, and R. L. Mancuso Jun. 1977 257 p refs
(Contract EPA-68-01-3807; SRI Proj. 5338)
(PB-275459) Avail: NTIS HC A12/MF A01 CSCL 13B

The computer program for a completely revised version of the APRAC-1A diffusion model is presented and discussed. The code uses EPA's emissions calculation methodology. Gridded, and link by link emissions can be output for hydrocarbons, carbon monoxide or oxides of nitrogen. Diffusion calculations made use of a receptor-oriented Gaussian plume model. Local winds at the receptor can be used; they are interpolated from multiple wind inputs. Mixing heights were calculated from sounding data, or input directly. GRA

N78-20667# PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio.
REVISED TECHNICAL GUIDE FOR REVIEW AND EVALUATION OF COMPLIANCE SCHEDULES FOR AIR POLLUTION SOURCES Final Report
Richard Gerstle, Fred Hall, and Yatendra Shah May 1977 431 p
(Contract EPA-68-01-3150)
(PB-276138/5; EPA-340/1-77-017) Avail: NTIS HC A19/MF A01 CSCL 13B

Schedules for new industries were included and control systems were reviewed and evaluated based on information supplied by the manufacturers. Also included was a description of the compliance schedule format, summary schedules by type of control device, and an explanation of various factors which affect installations. Process, description, emission sources, emission characteristics, and commonly used control equipment were given for each industry studied. GRA

N78-20668# Washington State Univ., Pullman. Coll. of Engineering.
ATMOSPHERIC HYDROCARBON CONCENTRATIONS IN GLOBAL BACKGROUND AIR SAMPLES
R. A. Rasmussen and E. Robinson Jul. 1977 17 p refs
Sponsored by Coordinating Research Council, Inc., New York
(PB-275759/9; CRC-APRAC-CAPA-11/15; Rept-77-13-48)
Avail: NTIS HC A02/MF A01 CSCL 13B

Results of hydrocarbon analysis of air samples obtained over the Pacific from about 75 degrees N to 61 degrees S are presented. Samples were obtained from the upper troposphere and lower stratosphere between October 26 and November 18, 1976. Data for halocarbon compounds, CH4 and C2 hydrocarbons, are presented but interpretive comments are limited to the hydrocarbon data. GRA

N78-20669# Bureau of the Census, Washington, D. C.
ENVIRONMENTAL QUALITY CONTROL GOVERNMENTAL FINANCES, FISCAL YEAR 1974 - 1975
Apr. 1977 40 p
(PB-275760/7; GSS76-83) Avail: NTIS MF A01; SOD HC as C3.145:83 CSCL 13B

Expenditure and revenue data are shown for water quality control, air quality control, land quality control, land quality control (solid waste management), and other environmental controls. Data on local government revenue and expenditure for sewerage activities and sanitation other than sewerage activities are presented by 74 major standard metropolitan statistical areas and component counties. GRA

N78-20670# Carnegie-Mellon Univ., Pittsburgh, Pa.
RETROSPECTIVE ASSESSMENT OF WASTEWATER TECHNOLOGY IN THE UNITED STATES: 1800 - 1972, APPENDICES
J. A. Tarr, F. C. McMichael, and J. McCurley Oct. 1977 133 p refs
(Grant NSF ERP-75-08870)
(PB-275884/5; NSF/RA-770352) Avail: NTIS HC A07/MF A01 CSCL 13B

Through the methods of retrospective and prospective analysis, the development of the technology, its social and environmental impacts, and the origins of regulation in regard to water quality were traced. The internal structure of technology, the dynamics of technological change, the interaction of science and technology, the role of values in a technology, and technology and organizational or social change are examined. The interaction of science and law in regulating American water quality, and the general ideas underlying the common law of nuisance and the inherent policy power of governments are outlined. GRA

N78-20671# Lincoln Lab., Mass. Inst. of Tech., Lexington.
TUNABLE LASER SPECTRAL SURVEY OF MOLECULAR AIR POLLUTANTS Final Report
A. Mooradian and A. S. Pine May 1977 116 p refs
(Grant NSF AEN-71-01922-A03)
(PB-276188/0; NSF/RA-770379) Avail: NTIS HC A06/MF A01 CSCL 07D

High resolution near-infrared spectra of several hydrocarbons and other light molecules of atmospheric significance were surveyed and cataloged using a difference-frequency laser spectrometer. The molecular spectral surveys and analyses presented provide information on spectral signatures absolute absorption intensities and pressure and temperature effects. High resolution spectra of methane and formaldehyde in the region of their fundamental C-H stretching bands are presented. Also discussed are some instrumentation advances in the laser spectrometer system which improves its precision and data handling capabilities. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N78-20672 California Univ., Berkeley.
THREE-DIMENSIONAL NUMERICAL MODELLING IN RESISTIVITY AND IP PROSPECTING Ph.D. Thesis
Mohamed Rida Bakbak 1977 136 p
Avail: Univ. Microfilms Order No. 77-31275

A numerical scheme based on the finite element method was used to solve the inhomogeneous integral equation for the cases of rectangular prismatic shaped bodies. The integral equation was reduced to a matrix equation, which was solved numerically for the charge density function. The potential distribution of the surface of the ground was calculated by integrating over the surface charge density. The solution was used to construct anomaly patterns of apparent resistivity and induced polarization responses for different electrode configurations. Dissert. Abstr.

N78-20673 California Univ., Berkeley.
INTERNAL WAVES AND HYDROMAGNETIC INDUCTION IN THE EARTH'S CORE Ph.D. Thesis
Peter Lee Olson 1977 143 p

Avail: Univ. Microfilms Order No. 7731486

A theoretical investigation of possible long-period waves in the core was studied. For the outer core, equations describing free oscillations in a rotating, stratified, self-gravitating fluid sphere with radial gradients in temperature and density were developed starting with the equations of hydrodynamics. The resulting system was solved by ignoring the local horizontal component of the earth's rotation vector and retaining only the vertical component, which leads to the Laplace tidal equation. The solutions show that interaction of buoyancy forces and rotation results in two types of waves with amplitudes confined predominantly to the outer core. The second part develops and applies a numerical method to integrate the hydromagnetic induction equation which describes the evolution of magnetic field immersed in a moving conductor. Dissert. Abstr.

N78-20674 California Univ., Berkeley.
SEISMOLOGICAL STUDIES OF STRONG MOTION RECORDS Ph.D. Thesis
Jafar Shoja-Taheri 1977 193 p
Avail: Univ. Microfilms Order No. 77-31537

Problems pertinent to seismological and engineering interpretations of strong ground motions in earthquakes were studied. Results included a form of strong motion accelerogram and its associated generalized spectrum. Statistical analysis of two California earthquakes indicated that the useable long period of ground displacement obtained from double integration of accelerogram records was limited by two major sources of error; human reading and base-line corrections. A modification of the conventional method of frequency domain integration was developed to avoid these deficiencies. A detailed seismological interpretation of the strong motion records for the California earthquake was attempted. Velocity and displacement traces integrated from the accelerogram were used to study earthquake mechanisms and waveforms. Dissert. Abstr.

N78-20675 California Univ., Berkeley.
ELASTICITY, CONSTITUTION AND TEMPERATURE OF EARTH'S LOWER MANTLE Ph.D. Thesis
Malcolm Robert Somerville 1977 139 p refs
Avail: Univ. Microfilms Order No. 7731545

Polymorphic layering of the lower mantle was suggested to explain localized radially symmetric fine structure evidenced in array measurements of the compressional wave travel-time gradient. This postulate was supported by the results of static and dynamic compression experiments on certain ferromagnesian minerals. The postulate bears important implications for the physics of the lower mantle, even though the phase transformations involve relatively minor increments of density and incompressibility. Making use of constraints on the lower mantle density distribution afforded by the inversion of normal mode observations, the application of the generalized Adams-Williamson equation are inverted so as to estimate the average temperature gradient. Dissert. Abstr.

N78-20676 California Univ., Berkeley.
SHEAR WAVE VELOCITY STRUCTURE IN THE EARTH FROM DIFFERENTIAL SHEAR WAVE MEASUREMENTS Ph.D. Thesis
Robert Allan Uhrhammer 1977 180 p
Avail: Univ. Microfilms Order No. 7731570

Three methods for reducing the effects of systematic errors in the S travel times were used: (1) adjusting observed differential S-P times to account for the effects of ellipticity and hypocentral depth; (2) weighting the equations of condition to reduce the effects of nonrandom distributions of seismographic stations and epicenters on the earth's surface and effects of nonrandom azimuthal distribution of stations and epicenters; and (3) simultaneously estimating azimuthally dependent source and station adjustments along with the cubic spline coefficients which were used to represent the differential S-P travel times. Statistical tests were constructed to determine if the selected stations and epicenters were randomly distributed on the earth's surface. Statistical tests were also constructed to test if the azimuthal distributions of the stations about the epicenters and vice versa are random. Dissert. Abstr.

N78-20677 State Univ. of New York, Albany.
DROP FREEZING IN A DIFFUSION-MILLIKAN CHAMBER Ph.D. Thesis
Kwang-Cheng Samuel Chang 1977 132 p
Avail: Univ. Microfilms Order No. 77-32242

The freezing manner of supercooled water drops, the fragmentation during the drop freezing process and the possible meteorological relevance were studied. The charged drops were suspended electrostatically in the D-M Chamber, which was capable of providing the suspended drop with an environment of accurately controlled temperature. The freezing of a total of about 14,000 drops was observed through the microscope visually and photographically. The percentage of drops that shattered upon freezing was found to increase with drop size and with decreasing temperature. The mean number of secondary particles produced per shattered drop also generally increased with drop size, but did not show any dependence on temperature. Dissert. Abstr.

N78-20678 Maryland Univ., College Park.
POTENTIAL VORTICITY TRANSPORT AND STRATOSPHERIC WARMINGS Ph.D. Thesis
Keith Willis Johnson 1977 86 p
Avail: Univ. Microfilms Order No. 77-30538

Infrared and microwave sensor observations from the NIMBUS 5 satellite were used in a study of stratospheric warming. Retrieved temperatures were analyzed each day and height fields for these levels were calculated hydrostatically, using NMC 100 mb height and temperature analyses as a lower boundary for the integration. Quasi geostrophic relationships were used to calculate winds, potential vorticity and related parameters. Observational features were compared with those predicted by several theoretical models of stratospheric warmings. The critical layer interaction associated with the zero mean zonal wind line is identified as being present, although only for a short period of time. Waves with a time variation of amplitude are also shown to be important. Dissert. Abstr.

N78-20679 California Univ., Berkeley.
EXPERIMENTAL EVALUATION OF SEISMIC DESIGN METHODS FOR BROAD CYLINDRICAL TANKS Ph.D. Thesis
Douglas Potter Clough 1977 259 p
Avail: Univ. Microfilms Order No. 7731322

The current seismic design approach for cylindrical tanks is presented in detail, and its application in a typical design situation is illustrated. Records of tanks damaged in four earthquakes were examined, and consistent with the predictions of current seismic design methods, a relatively high earthquake vulnerability was found in tanks with height greater than radius. Instances of behavior not consistent with predictions of seismic damage were noted, and it was concluded that damaging response mechanisms not accounted for in present design assumptions exist. The need for an experimental physical model study, to indicate the magnitude of error in present design procedures and the importance of modelling geometric and support eccentricities in refined liquid-shell analyses is clearly demonstrated. Considerations in the development of more refined analytical models are discussed. Dissert. Abstr.

N78-20680 Stanford Univ., Calif.
PALEOMAGNETIC EVIDENCE FOR TECTONIC ROTATION OF THE OREGON COAST RANGE Ph.D. Thesis
Robert Whitten Simpson, Jr. 1977 167 p
Avail: Univ. Microfilms Order No. 7802239

Paleomagnetic directions from Eocene sedimentary and volcanic rocks in the Oregon Coast Range were studied and it was proposed that observed paleomagnetic declinations were the result of tectonic rotation of a block 225 km in length extending from just north of the Klamath Mountains to Newport. The consistency of the paleomagnetic results and of measured current directions in the sediments argue that this block had not been internally deformed since the middle Eocene. Dissert. Abstr.

N78-20681 Stanford Univ., Calif.
A STUDY OF HOLOCENE DISPLACEMENT HISTORY ALONG THE SOUTH-CENTRAL REACH OF THE SAN ANDREAS FAULT Ph.D. Thesis

Kerry Edward Sieh 1977 243 p
Avail: Univ. Microfilms Order No. 78-02238

The California earthquake of 1857 is considered, along with several meters of lateral slip along the trace of the San Andreas fault which accompanied it. Historical records suggest that the rupture extended for a distance of 340 to 400 kilometers included several tens of kilometers of the currently creeping reach of the fault in central California. Dissert. Abstr.

N78-20682 Cornell Univ., Ithaca, N. Y.
AN EXPERIMENTAL STUDY OF TWO-PHASE HYDROTHERMAL CONVECTION IN A POROUS MEDIUM WITH APPLICATIONS TO GEOLOGICAL PROBLEMS Ph.D. Thesis
Carl Henderson Sondergeld 1977 115 p
Avail: Univ. Microfilms Order No. 7802066

Two-phase hydrothermal convection in a porous layer was studied experimentally using a sand box and a flow visualization tank. The observations were applied to natural geothermal systems and to problems in porphyry metal and mercury mineralization. Experiments were performed with glass beads and distilled water. The thickness of the matrix layer was varied from 10 to 20 cm. Basal heat fluxes up to about 30 times the calculated maximum conductive flux were used. The permeability of the experiments consisted of uniformly heating a water saturated matrix along its base until boiling occurred. Convective fluid motions were detected using horizontal and vertical arrays of temperature sensors, water level fluctuations and photographs. The boundary conditions for the experiments were: (1) a permeable isothermal upper surface; (2) adiabatic side walls; and (3) uniform base temperature. Dissert. Abstr.

N78-20683 Florida State Univ., Tallahassee.
THE CONTRIBUTION OF SYNOPTIC SCALE INTERACTION OF UPPER AND LOWER TROPOSPHERE TO THE MAINTENANCE OF THE SUMMER CLOUD CLUSTER MAXIMUM OVER THE EASTERN CARIBBEAN SEA Ph.D. Thesis
Robert Stewart Ross 1977 221 p
Avail: Univ. Microfilms Order No. 7801510

It is shown that an interaction synoptic scale systems of the upper and lower troposphere play an important role in establishing a summer cloud cluster maximum over the eastern Caribbean Sea. The existence of such a cloud maximum is confirmed by a climatological study of cloud cluster locations for four summers. A carefully selected case of cloud cluster occurrence was studied using a diagnostic nonlinear balance model. Model output was used to formulate a hypothesis for the role of the synoptic scale in maintaining the cloud cluster maximum. This hypothesis states that a cloud cluster frequently forms over the eastern Caribbean in summer as a region of lower tropospheric rising motion produced by warm air advection, associated with a westward migrating lower tropospheric warm anticyclonic eddy, moves underneath a quasistationary upper tropospheric thermal trough. Dissert. Abstr.

N78-20684 Northeastern Univ., Boston, Mass.
DECONVOLUTION OF GEOPHYSICAL TIME SERIES Ph.D. Thesis
Manuel Thomas Silvia 1977 302 p
Avail: Univ. Microfilms Order No. 7800297

The problem addressed is the development of a procedure which enables one to estimate the reflection coefficients from a seismogram recorded at the surface. The transfer function of the earth, under the assumption of vertical plane wave motion, is developed as the ratio of two polynomials in the complex variable z. The denominator of this transfer function is always minimum-phase, whereas the numerator is not necessarily minimum-phase. When the magnitudes of the reaction coefficients are less than 0.1, the numerator is approximated by a polynomial whose coefficients are the reflection coefficients; the denominator is approximated by a polynomial whose leading coefficient is one and the remaining coefficients given by the serial correlations of the reflection coefficients. Dissert. Abstr.

N78-20685 Princeton Univ., N. J.
SOURCE PROCESSES OF THREE COMPLEX DEEP FOCUS EARTHQUAKES Ph.D. Thesis
Richard A. Strelitz 1977 288 p
Avail: Univ. Microfilms Order No. 78-00275

The problems of epicentral location and methods for using information from several phases simultaneously to reduce the uncertainty in the location are discussed with emphasis on improving the seismogram deconvolution filter, possible sources of error encountered when converting analogue seismograms to digital form and a means of interactivity unravelling some of the complexity present in the body waves of the earthquakes studied. A technique for determining the source type, orientation and strength of an earthquake using body wave data and an inversion of the moment tensor used to describe the source is presented along with a master event scheme using relative amplitudes for determining source mechanisms. The results of the application of these methods are discussed for earthquakes that occurred in Peru-Bolivia (August 15, 1963), Colombia (July 31, 1970), and the Sea of Okhotsk (August 30, 1970).
Dissert. Abstr.

N78-20686 California Univ., Los Angeles.
TOPICS IN PLANETARY PLASMASPHERES Ph.D. Thesis
Chin-Kung Chen 1977 157 p
Avail: Univ. Microfilms Order No. 7801718

Contributions are made to the understanding of two distinct kinds of planetary plasmaspheres: namely the earth-type characterized by an ionospheric source and a convection limited radial extent, and the Jupiter-type characterized by a satellite source and a radial extent determined by flux tube interchange motions. In both cases the central question is the geometry of the plasma distribution in the magnetosphere as it is determined by the appropriate production and loss mechanisms. The characteristic size of the earth's plasmasphere is determined by a dynamic equilibrium between two independent processes: depletion by magnetospheric convection and refill by the plasma flux from the ionosphere. It is shown that Io's ions are the possible sources for the Jovian inner low energy plasma regime discovered by Pioneer 10. The most effective loss mechanisms for these ions to be transported inward to the inner plasmasphere and outward to the outer plasmasphere are the cross-L diffusion driven by atmospheric winds. Dissert. Abstr.

N78-20687 California Inst. of Tech., Pasadena.
A CONTRIBUTION TO THE STUDY OF THE SEISMICITY OF SOUTHERN CALIFORNIA, PART 1. INVERSION OF PHASE TIMES FOR HYPOCENTERS AND SHALLOW CRUSTAL VELOCITIES, PART 2 Ph.D. Thesis
James Alan Hileman 1978 237 p
Avail: Univ. Microfilms Order No. 7732568

Southern California seismicity data for the period 1932 through 1975 are summarized in a series of epicenter maps. These maps show the seismic activity for one year periods, for five year periods, and as summaries for all earthquakes with magnitudes equal to or greater than 4, 5, and 6 respectively. Enlarged epicenter maps are given for the Los Angeles area and for the more significant aftershock sequences in the region.
Dissert. Abstr.

N78-20688*# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
VLF TRANSMISSION INDUCED SLOT ELECTRON PRECIPITATION Interim Report
Alfred L. Vampola 5 Dec. 1977 19 p refs
(Contracts NAS5-22450; F04701-77-C-0078)
(NASA-CR-156062; AD-A049086; TR-0078(3960-05)-2; SAMSO-TR-77-217) Avail: NTIS HC A02/MF A01 CSCL 04/1

Analysis of electron observations in the drift and bounce loss cones of the slot region of the magnetosphere indicates that the predominant mode in which electrons in the 100 to 400 keV energy range arrive in the drift loss cone is via discrete events. These events are usually traceable back to the vicinity of a high-power-level VLF transmitter. No gradual buildup of electron flux, proceeding eastward from the South Atlantic Anomaly, is observed. Estimates of the loss rate due to the discrete events show that this process can result in a depletion of 50% per day of the electron flux in the slot region. The wave-particle interaction must occur relatively low on the field line (lambda approximately 30 deg to 50 deg) because of the relationship of particle energies and wave frequencies involved.

Additional scattering of the particles near the equator, either by power-line harmonic emissions or naturally occurring ELF hiss, is required to transport the particles to the lower interaction region. Author (GRA)

N78-20689*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A PROBABILISTIC MODEL OF INSOLATION FOR THE MOJAVE DESERT AREA
O. V. Hester and M. S. Reid 1 Mar. 1978 36 p refs
(Contract NAS7-100)
(NASA-CR-156140; JPL-Pub-78-11) Avail: NTIS HC A03/MF A01 CSCL 04A

A discussion of mathematical models of insolation characteristics suitable for use in analysis of solar energy systems is presented and shows why such models are essential for solar energy system design. A model of solar radiation for the Mojave Desert area is presented with probabilistic and deterministic components which reflect the occurrence and density of clouds and haze, and mimic their effects on both direct and indirect radiation. Multiple comparisons were made between measured total energy received per day and the corresponding simulated totals. The simulated totals were all within 11 percent of the measured total. The conclusion is that a useful probabilistic model of solar radiation for the Goldstone, California, area of the Mojave Desert has been constructed. Author

N78-20690*# Science Applications, Inc., Huntsville, Ala.
ATMOSPHERIC STUDY RELATING TO PAD LIFT-OFF AND ENTRY LANDING Final Report
R. L. King 22 Dec. 1977 84 p refs
(Contract NAS8-31173)
(NASA-CR-150621; SAI-78-780-HU) Avail: NTIS HC A05/MF A01 CSCL 04A

A relationship between the atmospheric general circulation and geophysical hydrodynamic experiments was sought by attempting to find a relationship between wave number and temperature gradient at mid-latitudes at 500 mb. To this end data were gathered from four winter seasons and analyzed. The statistical analysis failed to provide convincing support for the hypothesis of a direct relationship between wave number and temperature gradient, although an indication that the transient waves may be so related was noted. Author

N78-20691*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC SOUNDING BY INFRARED HETERODYNE SPECTROSCOPY
Mian M. Abbas (Maryland Univ., College Park), Virgil G. Kunde, Michael J. Mumma, Theodor Kostiuk, David Buhl, and Margaret A. Frerking (MIT, Cambridge) Jan. 1978 48 p refs
(NASA-TM-78066) Avail: NTIS HC A03/MF A01 CSCL 04A

Intensity profiles of infrared spectral lines of stratospheric constituents can be fully resolved with a heterodyne spectrometer of sufficiently high resolution. The constituents' vertical distributions can then be evaluated accurately by analytic inversion of the measured line profiles. Estimates of the detection sensitivity of a heterodyne receiver are given in terms of minimum detectable volume mixing ratios of stratospheric constituents, indicating a large number of minor constituents which can be studied. Stratospheric spectral line shapes, and the resolution required to measure them are discussed in light of calculated synthetic line profiles for some stratospheric molecules in a model atmosphere. The inversion technique for evaluation of gas concentration profiles is briefly described and applications to synthetic lines of O3, CO2, CH4 and N2O are given. Author

N78-20692*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFORMATION THEORY AND THE EARTH'S DENSITY DISTRIBUTION
David Parry Rubincam Feb. 1978 26 p refs Submitted for publication
(NASA-TM-78088) Avail: NTIS HC A03/MF A01 CSCL 08G

The present paper argues for using the information theory approach as an inference technique in solid earth geophysics. A spherically symmetric density distribution is derived as an example of the method. A simple model of the earth plus knowledge of its mass and moment of inertia leads to a density distribution. Future directions for the information theory approach in solid earth geophysics as well as its strengths and weaknesses are discussed. Author

N78-20693*# SRI International Corp., Menlo Park, Calif.
PHOTODISSOCIATION OF CO2 AND QUENCHING OF METASTABLES Final Report
Tom G. Slanger 23 Feb. 1978 24 p refs
(Contract NASw-2849; SRI Proj. PYU-4725)
(NASA-CR-156137; MP-78-17) Avail: NTIS HC A02/MF A01 CSCL 04A

Investigations in four different areas were carried out to further our understanding of the chemistry of the atmospheres of Mars and Venus. CO2 photodissociation quantum yields were determined in the 1300-1500 A spectral region by measuring both CO and oxygen atoms. The O(1S) quantum yield was determined for CO2 photodissociation in the 1060-1175 A spectral region. The measurement resolves the differences between two earlier experiments, and demonstrates that the O(1S) yield is unity throughout most of the measured region. The pathways for the quenching of O(1S) by N2O, CO2, H2O and NO were investigated and the source of the Venus nightglow, detected by Venera 9 and 10, was investigated. What appears to be a new O2 band system, was detected although the identity of the transition is not yet evident. Author

N78-20694# Army Electronics Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
MIE THEORY SENSITIVITY STUDIES. THE EFFECTS OF AEROSOL COMPLEX REFRACTIVE INDEX AND SIZE DISTRIBUTION VARIATIONS ON EXTINCTION AND ABSORPTION COEFFICIENTS. PART 1: TABULATED COMPUTATIONAL RESULTS
S. G. Jennings Nov. 1977 316 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A049031; ECOM-DR-77-5-Pt-1) Avail: NTIS HC A14/MF A01 CSCL 20/6

This work contains tabulated data of the Mie volume extinction, absorption, and scattering coefficients, 1/km, as a function of the real part, n, and imaginary part, k, of the complex index of refraction for a wide range of particle size distribution. Lognormal particle size distributions, which possessed geometric mean radii from 0.005 micrometers up to 10 micrometers in radius, and geometric standard deviation from 1.0 up to 2.5, were used in the calculations. The computations were performed at wavelengths 0.55, 0.6943, 1.06, 3.8, and 10.6 micrometers. Values of real index of refraction from 0.1 up to 6.5 and imaginary index values from 0.001 up to 8.0 were used in the calculations. The results are normalized to a total particle mass of 100 micrograms/cu.m. and a particle density of 2.5 g/cu.cm. The computational results will be used to explore the effect of both the real and imaginary part of the index of refraction on transmission in the 0.55-1.06 micrometers and 1.06-10.6 micrometers wavelength range. This will determine the extent to which the real and imaginary index influences transmission through the atmosphere and its consequential effect on electro-optical systems. Author (GRA)

N78-20695# SRI International Corp., Menlo Park, Calif.
MODELING FOR MULTISPECTRAL INFRARED AND MICROWAVE REMOTE SENSING OF THE TROPOSPHERE Final Report, 6 Aug. 1976 - 30 Sep. 1977
Paul A. Davis and John S. Ostrem Sep. 1977 88 p refs
(Contract F19628-76-C-0275; SRI Proj. ERU-567)
(AD-A050170; AFGL-TR-77-0201) Avail: NTIS HC A05/MF A01 CSCL 04/1

The major objective of this study was to establish background information on the relative responsiveness of multispectral infrared and microwave sensors typical of satellite radiometric sounders that probe tropospheric regions containing clouds. Such information supports satellite techniques to improve sensing of atmospheric structure and cloud features, and reduces the dependence on increased surface and airborne instrumentation. Different spectral intervals with the same equivalent temperature response from the cloud-free atmosphere also facilitate the interpretation of remote measurements in the presence of clouds or other aerosols. GRA

N78-20696# Defence Research Establishment Valcartier (Quebec).
LABORATORY SIMULATION OF ATMOSPHERIC TURBULENCE FOR OPTICAL PROPAGATION STUDIES
L. R. Bissonnette Aug. 1977 48 p refs In ENGLISH; FRENCH summary
(AD-A045539; DREV-R-4075/77) Avail: NTIS HC A03/MF A01 CSCL 04/1

Accurate simulation, on a laboratory scale, of atmospherically induced scintillation phenomena is achieved by creating an unstable vertical temperature gradient in a 1.5-m long, 40-cm wide and 60-cm deep tank filled with water. The turbulent index of refraction has a statistical structure similar to that of the atmosphere; in particular, the Kolmogoro's inertial subrange model is verified. The turbulent irradiance data in the simulation medium have the same features respecting power spectrum, saturation and supersaturation and obey the same theoretical scaling law as in the atmosphere. Typically, the characteristic propagation distances are reduced by a factor of 300 to 400.
Author (GRA)

N78-20697# McGill Univ., Montreal (Quebec).
A COMPARATIVE STUDY OF FRICTION AND NUMERICAL SMOOTHING IN A GLOBAL MODEL OF ATMOSPHERIC FLOW Final Report, 1 Nov. 1976 - 31 Aug. 1977
M. M. Ibrahim Hanscom AFB, Mass. AFGL Aug. 1977 89 p refs
(Contract F19628-77-C-0056; AF Proj. 2310)
(AD-A048476; AFGL-TR-77-0177) Avail: NTIS HC A05/MF A01 CSCL 04/2

A study is made of different techniques of assuring the long term numerical stability of a one-layer global primitive equation model which uses the pseudospectral technique for the evaluation of horizontal derivatives. It is found that numerical filtering is much more suitable than the use of a linear viscosity term both from the point of view of the stability achieved and the cost of the computation. Author (GRA)

N78-20698# Aeronutronic Ford Corp., Billings, Mont. Engineering Services Div.
MONTANA LARGE APERTURE SEISMIC ARRAY Semiannual Technical Report, 1 Apr. - 30 Sep. 1977
Robert E. Matkins 28 Oct. 1977 70 p refs
(Contract F08606-77-C-0009)
(AD-A050270; TR-2140-77-99) Avail: NTIS HC A04/MF A01 CSCL 17/10

The operation and maintenance activities at the Montana Large Aperture Seismic Array and Data Center during the period from April 1 and September 30, 1977 are described. Operations in data recording and event processing are detailed. Seismograph frequency response measurements and performance statistics are presented. Maintenance activities in the array and at the data and maintenance center are discussed. Author (GRA)

N78-20699# Naval Ocean Systems Center, San Diego, Calif. Electromagnetic Propagation Div.
INVERT: A COMPUTER PROGRAM FOR OBTAINING D-REGION ELECTRON DENSITY PROFILES FROM VLF REFLECTION COEFFICIENTS Interim Report
David G. Morfitt and Charles H. Shellman 30 Nov. 1977 188 p refs
(Contracts DNA-MIPR-77-521; DNA-MIPR-78-504)
(AD-A050256; NOSC/IR-782) Avail: NTIS HC A09/MF A01 CSCL 20/14

INVERT is a FORTRAN computer program designed to study the feasibility of obtaining electron density distributions of the D-region of the ionosphere. These electron density profiles would be derived from measurements of ionospheric reflection coefficients. The radio propagation frequencies would be limited to the VLF band, particularly 3-20 kHz. This report contains a discussion of the analytical approach taken in INVERT, a FORTRAN listing of the program, instructions for using the program and some sample calculations using simulated data. The program has not been used with real data. Author (GRA)

N78-20700# Texas Instruments, Inc., Dallas. Equipment Group.
CONTINUATION OF THE SEISMIC RESEARCH OBSERVATORIES EVALUATION
Alan C. Strauss and Leonard C. Weltman 16 Nov. 1977 284 p refs
(Contract F08606-77-C-0004; ARPA Order 2551)
(AD-A050316; TI-ALEX(01)-TR-77-02) Avail: NTIS HC A03/MF A01 CSCL 17/10

This report presents the results of a continued evaluation of the Seismic Research Observatory stations performed by Texas Instruments Incorporated at the Seismic Data Analysis Center in Alexandria, Virginia. During the time period this evaluation was carried out, data were available from six stations-Albuquerque, New Mexico (ANMO); Guam, Marianas Islands (GUMO); Mashhad, Iran (MAIO); Narrogin, Western Australia (NWAO); Taipei, Taiwan (TATO); and Wellington (South Karori), New Zealand (SNZO). The major areas of investigation in the evaluation were: (1) Analysis of RMS noise levels, RMS noise trends, and noise spectral content; (2) Estimation of the quality of performance of the short-period automatic event detector; (3) Estimation of the detection capability of the individual stations on a regionalized basis; (4) Estimation of the discrimination capability of the individual stations; and, (5) Estimation of the detection capability of the stations functioning as a network. In the course of processing and analyzing data for these areas of investigation, estimates were made of the data quality, station reliability, and probability of mixed events. GRA

N78-20701# Texas Instruments, Inc., Dallas.
STUDY OF ADAPTIVE BEAMFORMING ALGORITHMS FOR LOW MAGNITUDE SEISMIC P-WAVE DETECTION
Wen-Wu Shen 1 Nov. 1977 60 p refs
(Contract F08606-77-C-0004; ARPA Order 2551)
(AD-A050317; TI-ALEX(01)-TR-77-05) Avail: NTIS HC A04/MF A01 CSCL 17/10

A linear adaptive algorithm was developed for array beamforming purposes. The design goal for the algorithm was to minimize the squared filter output subject to the constraint which allows energy propagating from the array steering direction to pass without being distorted. The adaptive filter coefficients were designed as time-varying filters applied to each channel subject to the above constraints. The adaptation rate was inversely varied with filter output and total input channel power. Performance of the algorithm was studied by using recorded short-period array data from the Korean Seismic Research Station. To demonstrate adaptive beamforming, a high amplitude signal from Kamchatka, a medium amplitude signal from eastern Kazakh, and a number of low amplitude signals from central Eurasia were processed. Results of signal-to-noise ratio gain relative to a conventional beamformer among the events tested were consistent and were in the range of 4.5 to 6.5 db in the wide passband. Much better signal-to-noise ratio improvement was obtained in a low frequency passband. GRA

N78-20702# Texas Instruments, Inc., Dallas. Equipment Group.
THE EXTENDED INTERACTIVE SEISMIC PROCESSING SYSTEM (ISPSE)
Jeffrey S. Shaub and David G. Black 5 Dec. 1977 183 p refs
(Contract F08606-77-C-0009; ARPA Order 2551)
(AD-A050318; TI-ALEX(01)-TR-77-09) Avail: NTIS HC A09/MF A01 CSCL 17/10

The primary intention of this report is to provide a comprehensive user manual for the Extended Interactive Seismic Processing System (ISPSE). ISPSE supports an interactive graphics environment on the PDP-15 computer located at the Seismic Data Analysis Center (SDAC) for the purpose of analyzing long- and short-period seismic waveforms. In addition to general signal analysis functions, ISPSE demonstrates the feasibility of utilizing interactive graphics for short-period event discrimination as described in the report entitled 'Documentation of the Extended Interactive Seismic Processing System (ISPSE)' (Shaub, et al., 1977). This report discusses system features, supplemental to that documentation, to ensure optimal utilization of ISPSE for seismic problem solving. These features include: a programmable mode of operation by which the user may define standard seismic processing tasks on-line; and an interpretive high level interactive Seismic Programming Language (ISPL) with which a user may define functions that access, perform computation upon, and

display seismic data in tabular and graphic form for evaluation and analysis. Author (GRA)

N78-20703# Colorado Univ., Boulder.
INVESTIGATIONS OF TECTONIC STRESS Final Technical Report, 16 Sep. 1975 - 31 Dec. 1976
Charles B. Archambeau 26 Apr. 1977 169 p refs
(Contract F19628-76-C-0061; ARPA Order 1795)
(AD-A047610; AFGL-TR-77-0104) Avail: NTIS HC A08/MF A01 CSCL 08/11

Results relating to the analytical modeling of earthquakes by relaxation-source theory models are summarized. A general theory of failure using concepts of a generalized phase change is developed. Applications to explosion-earthquake discrimination and earthquake source parameter estimation, particularly tectonic stress determinations, are discussed and the theoretical basis for M sub b - M sub s discrimination and discrimination using spectra magnitude parameters is emphasized. Computer based signal analysis methods are described and applications to the estimation of discriminatory parameters are illustrated, using a large data set Eurasia. Observational methods and results for p wave spectral discrimination of earthquakes and explosions are described, and it is concluded that the observed behavior of these spectral magnitudes is in agreement with the theoretical predictions and can serve as a very powerful discrimination procedure. Stress field estimates are inferred from the set of world-wide M sub b - M sub s data for the period 1968-1974, for the North Pacific region. The results show zones of high stress, the maximum being near 1 kbar, and that these zones are also seismic gaps. Small earthquakes occurring in these high stress regions are more explosion-like than normal due to the high stress drops associated with them. GRA

N78-20704# Naval Ocean Systems Center, San Diego, Calif. Electromagnetic Propagation Div.
A TECHNIQUE FOR OBTAINING D-REGION ELECTRON DENSITY PROFILES FROM VLF REFLECTION COEFFICIENTS Interim Report
David G. Morfitt and Charles H. Shellman 16 Nov. 1977 94 p refs
(Contract DNA-MIPR-77-521; DNA-MIPR-78-504)
(AD-A050293; NOSC/IR-781) Avail: NTIS HC A05/MF A01 CSCL 20/14

A technique is described for determining D-region electron density profiles from VLF reflection coefficients. Some of the problems concerning convergence of the iterative scheme are discussed as well as the constraints introduced to account for features of the profile for which information is not provided by reflection coefficient data. Also, an example is given where the technique is applied using simulated data. Author (GRA)

N78-20705# Texas Instruments, Inc., Dallas. Equipment Group.
SEISMIC DATA PREPARATION PROCEDURES
A. William Schmidt and Kimberly S. Wilson 20 Oct. 1977 55 p refs
(Contract F08606-77-C-0004; ARPA Order 2551)
(AD-A049922; TI-ALEX(01)-TR-77-10) Avail: NTIS HC A04/MF A01 CSCL 17/10

The computer programs currently being used to prepare seismic data for analysis on the PDP-15 computer, and the flow of data through them, are described briefly. The programs are being run by Texas Instruments Incorporated on the IBM 360/44 at the Seismic Data Analysis Center. New programs developed during the contract period are described in some detail. Some suggestions for future work are provided. Author (GRA)

N78-20706# Weapons Research Establishment, Salisbury (Australia).
DOPLATCH: A MOBILE, NORMAL INCIDENCE H. F. DOPPLER MEASURING EQUIPMENT FOR THE STUDY OF THE SPATIAL CORRELATION OF TRAVELING IONOSPHERIC DISTURBANCES.
J. Hockley Mar. 1977 35 p refs
(AD-A047063; WRE-TR-1795(A)) Avail: NTIS HC A03/MF A01 CSCL 04/1

An understanding of the morphology of travelling ionospheric disturbances is essential to short-range high-frequency direction finding, particularly for systems employing vertical triangulation and dynamic tilt correction techniques. A variety of methods have been used in the past to study these disturbances, but to date little statistical information has been obtained on the extent to which they can be correlated in space. In support of research in this area, a compact mobile H.F. doppler probe has been developed for deployment at spaced locations. Each of a group of such systems measures the apparent height of the local ionosphere and provides a doppler signature of overhead disturbances for later comparison and interpretation. Author (GRA)

N78-20707# Danish Meteorological Inst., Copenhagen.
OCCURRENCES OF THE POLAR SLANT E CONDITION - SEC AT NARSSARSSUAQ, GODHAVN, THULE, 1973
J. K. Olesen and I. S. Primdahl 1976 62 p refs
(Grant NATO-371)
(DMI-Geophys-Papers-R-47; ISBN-87-7478-122-7) Avail: NTIS HC A04/MF A01

Occurrence of the polar Slant E Condition (SEC) phenomenon as scaled from ionograms, recorded during 1973 at three observatories in Greenland located within the area from the auroral zone to the geomagnetic pole, is described. SEC is a special disturbed condition in the polar ionospheric E region. Ionogram identification criteria for the SEC phenomenon are given and the data recorded at the three stations are presented. Both monthly and yearly data tables were drawn up. ESA

N78-20708# World Meteorological Organization, Geneva (Switzerland).
EFFECTS OF HUMAN ACTIVITIES ON GLOBAL CLIMATE. A SUMMARY, WITH CONSIDERATION OF THE IMPLICATIONS OF A POSSIBLY WARMER EARTH
William W. Kellogg (U.S. Natl. Center for Atmospheric Res.) 1977 66 p refs
(WMO-486; WMO-TN-156; ISBN-92-63-10486-7) Avail: NTIS HC A04/MF A01; WMO, Geneva

The influences of mankind on the climate are discussed. These include the increase in atmospheric carbon dioxide concentration resulting from burning fossil fuels and the warming of the lower atmosphere through injection of aerosols, chlorofluoromethanes, nitrous oxide, and other infrared absorbing gases. The implications of a warmer earth are stressed and the value of long range climate forecasting is noted. Areas for further research are indicated. ESA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N78-20709 Maryland Univ., College Park.
A SYNOPTIC CLIMATOLOGICAL MODEL TO SPECIFY THE PROBABILITY OF PRECIPITATION Ph.D. Thesis
Dale Andrew Lowry 1977 185 p
Avail: Univ. Microfilms Order No. 7730542

Six seasons covering a three year development period were discussed. Probability estimates were made for projections from twelve to forty-eight hours for the conterminous United States. The accuracy of the estimates was quite high. Geographical areas were defined for each season. Fourteen areas were used during the sixth season. Predictor categories include relative humidity, precipitation amount, precipitable water, stability indices, upper-air heights, plus vertical and horizontal wind. Profiles showing correlation coefficients were generated for each field used in these categories for each of three twelve-hour periods in each area. The physical characteristics of the model were reflected in the predictors actually chosen through screening. Relative humidity was clearly the dominant predictor category for all time projections. Vertical velocity plays a secondary role while all other categories were reduced to minor roles. Dissert. Abstr.

N78-20710 Virginia Univ., Charlottesville.
SURFACE KINEMATIC CLUES TO CONVECTIVE RAINFALL PROCESSES Ph.D. Thesis

Stanley Leon Ulanski 1977 222 p
Avail: Univ. Microfilms Order No. 7800447

Emphasis was placed on viewing the rainfall regime in terms of the temporal and spatial changes in the surface fields of divergence and vorticity. Key kinematic variates of rainfall processes were quantified in terms of empirical relationships. Rainfall analysis showed that large severe thunderstorms accounted for most of the rainfall during the experiment. Conditioned upon the existence of identifiable convergence cells, the short range prediction of the location, severity and orientation of convective storms was operationally feasible. Surface moisture calculations showed that large, long lasting convergence cells accounted for the efficient vertical transport of water vapor to the storm. Dissert. Abstr.

N78-20711 Saint Louis Univ., Mo.
A NUMERICAL STUDY OF UPDRAFT-DOWNDRAFT INTERACTIONS DURING THE MATURE STAGE OF A ROTATING SUPERCELL THUNDERSTORM BASED UPON DOPPLER RADAR DATA Ph.D. Thesis
Raymond Grauel Bonesteele 1977 102 p
Avail: Univ. Microfilms Order No. 78-00475

Mature severe thunderstorms on the Great Plains have repeatedly been observed to maintain their quasi-steady circulation for several hours. One hypothesis suggests that interactions between updraft and downdraft in the lower portion of the storm (below 500 mb) may play an important role in maintaining the quasi-steady circulation. A three-dimensional rotating supercell thunderstorm model representative of the quasi-steady mature stage was developed to study such effects on the structure and internal dynamics of a storm. Emphasis was placed on determining the role played by perturbation pressure forces in promoting updraft-downdraft cooperation in the lower 6 km of a storm. A composite data set of horizontal winds, temperature, and mean environmental variables was developed by carefully analyzing and checking its internal consistencies within the modeling constraints. Dissert. Abstr.

N78-20712 Maine Univ., Orono.
WATER DROPLET GROWTH IN PURE ATMOSPHERES: ARGON, NITROGEN, OXYGEN, AND CARBON DIOXIDE Ph.D. Thesis
James Lynford Fastook 1977 114 p
Avail: Univ. Microfilms Order No. 78-01694

Water droplet growth measurements using a light scattering technique which allows the dynamic determination of radius as a function of time while the supersaturation ratio is varying due to changing pressure, temperature, and size of the droplets, were performed in argon, nitrogen, oxygen, and carbon dioxide. The experimental data were compared with a current theory of water droplet growth utilizing parameterized vapor and heat diffusion fields. Differences in thermal accommodation were expected due to the different molecular structures of the noncondensing gases, but none was observed within the sensitivity of the experimental apparatus. Sticking coefficients were determined and found to agree well with theory and other experiments. In the smaller size ranges accessible to this technique, generally larger sticking coefficients were required to fit the data. At larger sizes the sticking coefficient was found to be reduced by as much as a factor or two. Dissert. Abstr.

N78-20713 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. VOLUME 15, NO. 113: CATALOG OF LARGE SCALE WEATHER PATTERNS IN EUROPE [BERICHTE DES DEUTSCHEN WETTERDIENSTES, BAND 15, NR. 113: KATALOG DER GROSSWETTERLAGEN EUROPAS]
Paul Hess and Helmuth Brezowsky 1977 70 p refs In GERMAN; ENGLISH summary
(ISBN-3-88148-155-9) Avail: Issuing Activity

The fundamental problems of circulation patterns, the classification of large scale weather patterns, and, derived from it, the types of large scale weather patterns are discussed and the individual patterns are described in detail. Emphasis is laid on the description of their features and the nature of their meteorological conditions. Some statistical tables are presented and the problem of singularities is dealt with. Large scale weather patterns for all days in the period 1881 to 1968, a model for each pattern, and the relative occurrence frequencies of the different types of large scale weather patterns for each calendar day of the year are annexed. ESA

N78-20714 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie und Geophysikalische Wissenschaften.
METEOROLOGICAL DATA, SERIES A MONOGRAPHS. VOLUME 1, NO. 1: A CONTRIBUTION TO THE CLOUD CLIMATOLOGY OF EUROPE AND THE ATLANTIC OCEAN USING SATELLITE PICTURES [METEOROLOGISCHE ABHANDLUNGEN, SERIE A MONOGRAPHIEN. BAND 1, HEFT 1: EIN BEITRAG ZUR BEWOELKUNGSKLIMATOLOGIE EUROPAS UND DES ATLANTIKS ANHAND VON SATELLITENAUFNAHMEN]
Horst Malberg 1977 114 p refs In GERMAN; ENGLISH summary Sponsored by Deut. Forschungsgemeinschaft
Avail: Verlag Dietrich Reimer, Berlin

Cloud estimations for Europe and the Atlantic Ocean were made for the period December 1967 to November 1970 using ESSA 6 and ESSA 8 satellite data. The results comprise monthly and yearly average cloud cover; monthly and yearly variations of cumulus and stratus cloud components; average monthly and yearly occurrences of fair, cloudy, and overcast cloud situations; and the average maximum number of successive fair, cloudy, and overcast days. The influence of large scale circulation, orographic effects, and particularities of the atmospheric stability can be seen from the results, which are summarized in 132 maps. ESA

N78-20715 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie und Geophysikalische Wissenschaften.
METEOROLOGICAL DATA, SERIES A MONOGRAPHS. VOLUME 1, NO. 3: THUNDERSTORMS IN THE BERLIN AREA [METEOROLOGISCHE ABHANDLUNGEN, SERIE A MONOGRAPHIEN. BAND 1 HEFT 3: DIE GEWITTER IM BERLINER RAUM]
Juergen Pelz 1977 59 p refs In GERMAN; ENGLISH summary
Copyright. Avail: Verlag Dietrich Reimer, Berlin

From the material available in Berlin, a thunderstorm climatology for Berlin and the surrounding area was compiled. Observations go back to 1829, with some mean values reaching back to 1701. The series is incomplete however, with gaps from 1788 to 1828, from 1841 to 1847 and for 1945. Since thunderstorms around Berlin are not regularly distributed, and the observations come from different stations, the data sample is inhomogeneous. Except for a few cases, the data could not be reduced to one place. Author (ESA)

N78-20716# National Severe Storms Lab., Norman, Okla.
APPLICATION OF DOPPLER WEATHER RADAR TO TURBULENCE MEASUREMENTS WHICH AFFECT AIRCRAFT Final Report
J. T. Lee Jul. 1977 53 p refs
(Contract DOT-FA74WAI-495)
(AD-A048603/5; FAA-RD-77-145) Avail: NTIS
HC A04/MF A01 CSCL 04/2

Analysis of thunderstorm turbulence hazardous to aircraft operation and coordinated Doppler radar observations indicate a high potential for Doppler radar utilization particularly the mean velocity spectrum breadth observations in defining severe turbulence areas. The mean velocity processor and the Multi-moment Ling display are utilized with the radars to study vortex motion, turbulence, and wind shear areas. In addition, the plan shear indicator was also employed. A number of severe convective storms were penetrated by an instrumented aircraft directed into areas which analysis inferred to be turbulent. Aircraft recorded turbulence and concurrent Doppler data are compared. Utilization of the spectrum breadth calculated from the mean velocity data as a turbulence of signature was discussed. Vortex motion signature was also defined. Author

N78-20717*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NIMBUS 6 DATA CATALOG. VOLUME 11: 1 MARCH - 30 APRIL 1977, DATA ORBITS 8410 THROUGH 9226

Dec. 1977 271 p refs Prepared by Management and Technical Serv. Co., Beltsville, Md.
(Contract NAS5-23740)
(NASA-TM-79422) Avail: NTIS HC A12/MF A01 CSCL 04B

Operations of various experiments during the reporting period are summarized. Orbital elements, data availability times, anomalies in the data, geographic location, and time of data are tabulated. Montages obtained by infrared and microwave radiometers are included. Author

N78-20718*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A STUDY OF FORECAST GROWTH WITH A BAROTROPIC MODEL OF THE ATMOSPHERE
Isidore M. Halberstam 1 Apr. 1978 30 p refs
(Contract NAS7-100)
(NASA-CR-156138; JPL-Pub-78-3) Avail: NTIS HC A03/MF A01 CSCL 04B

A barotropic model of the atmosphere was used to test various sources of forecast error. These errors are classified as truncation error, physical error, or initial error. It was shown that growth patterns due to each category differ significantly. Initial errors were shown not to grow in a barotropic model contrary to reports of other studies which indicate that they basically do grow. Also, random initial errors were shown to decrease due to the filtering effect of the model itself. Results seem to indicate that instabilities are required for error growth, be they barotropic or baroclinic, and that random errors are not representative of true initial conditions. Author

N78-20719# North Dakota State Univ., Fargo.
AN EVALUATION OF THE NEED FOR AND DESIRED LOCATION OF ADDITIONAL METEOROLOGICAL STATIONS IN SOUTHWESTERN NORTH DAKOTA Final Report, Jun. 1976 - Mar. 1977
T. Method, D. Nantt, and J. M. Ramirez Mar. 1977 94 p refs Sponsored by North Dakota Regional Environmental Assessment Program, Bismarck
(PB-275643/5; NDRR-77/01) Avail: NTIS HC A05/MF A01 CSCL 04B

The need was assessed and the desired locations for additional meteorological monitoring stations in western North Dakota were identified. The need for augmenting the instrumentation at existing stations to provide adequate information necessary for comprehensive environmental assessments in the area were evaluated. A 15 week field monitoring program was undertaken. Two mobile units using metrosonde systems for collecting upper air information were employed to ascertain the areas where information gaps may exist. GRA

N78-20720# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TROPICAL CYCLONE CLOUD AND INTENSITY RELATIONSHIPS Ph.D. Thesis
Charles P. Arnold 1977 171 p refs
(AD-A049934; AFIT-CI-78-26) Avail: NTIS HC A08/MF A01 CSCL 04/2

This paper describes an observational study of tropical cyclones based on high resolution visual and infrared Defense Meteorological Satellite Program (DMSP) pictures of western North Pacific storms. It also utilizes composited rawinsonde data about storms in the same geographical region. It discusses the physical characteristics, cloud characteristics and wind and thermodynamic characteristics associated with each of four stages of tropical cyclone development (developing cluster, tropical depression, tropical storm, and typhoons). Among the physical characteristics discussed are typical storm sizes, types of banding most often observed, location and type of circulation center, intensification rates, and eye dimensions. Cloud characteristics include the percent of storm area covered by cirrus and convective cloud types and the distribution and characteristics of the basic convective element found in DMSP data. Among the wind and thermodynamic parameters investigated were vertical motion, vorticity, tangential wind, moisture, and temperature. GRA

N78-20721# Coastal Studies, Inc., College Station, Tex.
DEVELOPMENT OF SURGE 2 PROGRAM WITH APPLICATION TO THE SABINE-CALCASIEU AREA FOR HURRICANE CARLA AND DESIGN HURRICANES
Robert O. Reid, Andrew C. Vastano, and Thomas J. Reid Nov. 1977 222 p refs
(Contract DACW64-74-C-0015)
(AD-A049977; CERC-TP-77-13) Avail: NTIS HC A10/MF A01 CSCL 04/2

SURGE II is a program for calculation of storm surges and tides in a bay or estuary of the type where frictional resistance dominates over Coriolis force. It includes the provision for subgrid scale barriers and channels as well as allowing for overtopping of barriers and flooding of and recession from normally dry regions adjoining the bay or estuary. The theory and numerical algorithm is discussed in detail. A user's guide for the program is also provided. Application of the program, in respect to astronomical tides and hurricane surges, is made for the Sabine-Calcasieu region which straddles the Texas and Louisiana boundary. For normal tide conditions, cities such as Beaumont, Orange, and Lake Charles are connected to the sea via rivers, which in the numerical model must be represented as subgrid scale channels as long as the basic grid scale is of the order of a nautical mile. Under hurricane surge conditions, however, the overland flooding can greatly expand their connection to the sea. Calibration of channel friction is carried out via the astronomical tide simulation. Calibration of the block friction is carried out using data on a previous storm of record, Hurricane Carla. An example application is provided for standard project hurricanes (SPH). The response for a large radius SPH of slow speed and one of moderate speed of translation is examined. Also, the effect of rainfall is examined by running the latter storm with and without rainfall. GRA

N78-20722# Texas A&M Univ., College Station. Dept. of Meteorology.
REAL-TIME COMPUTER TECHNIQUES IN THE DETECTION AND ANALYSIS OF SEVERE STORMS FROM DIGITAL RADAR DATA Ph.D. Thesis
Thomas Edmund Sieland Aug. 1977 157 p refs
(Grant AF-AFOSR-3146-77)
(AD-A050155; AFIT-CI-78-33; AFOSR-78-0123TR) Avail: NTIS HC A08/MF A01 CSCL 17/9

An improved computer method was developed by which multi-tilt digital radar data can be interpolated in three dimensions and reduced to a two-dimensional display of partially vertically-summed reflectivity (Z) maps (PVSZ) in near real time. The computer method was developed by using digital radar data collected with the 10-cm radar at the National Severe Storms Laboratory in Norman, Oklahoma. Various combinations of interpolation schemes were used to develop the new computer method, and the resultant products were compared to determine whether or not significant features of a severe storm evident in constant altitude reflectivity (Z) maps (CAZM) are retained by the new reduction technique. In addition, the number of PVSZ layers were varied to determine the minimum needed for adequate depiction of the tilt of the storm core. Finally, severe storm data from New England were processed by using the new data-reduction technique to find out whether or not any of the severe-storm signatures observed in analyses of Oklahoma storms were evident in the New England digital radar data. GRA

N78-20723# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
A STUDY OF FORECAST ERRORS IN A BAROTROPIC OPERATIONAL MODEL FOR PREDICTING PATHS OF TROPICAL STORMS Final Report, 1 Oct. 1974 - 30 Sep. 1977
Frederick Sanders, Alan L. Adams, Norma J. B. Gordon, and Wade D. Jensen Hanscom AFB, Mass. AFGL Dec. 1977 38 p refs
(Contract F19628-75-C-0059)
(AD-A050173; AFGL-TR-77-0267) Avail: NTIS HC A03/MF A01 CSCL 04/2

To enable use of satellite cloud-motion vectors in the SANBAR model for prediction of tropical storm tracks, we have derived regression equations for estimating the tropospherically averaged flow from information at one, two, or three levels. Two-level results represent an improvement over climatology and a third level yields substantial further improvement. We find from a study of the 1975 season in the Atlantic Basin that reduction in initial position and track-velocity errors can produce substan-

tial improvement in position-forecast accuracy out to 72 hours range. We recommend a new procedure for evaluating and using wind observations within the region influenced by the storm circulation. The new method has the potential for substantial reduction of present forecast error for storms within 24 hours of landfall. Author (GRA)

N78-20724# World Meteorological Organization, Geneva (Switzerland).
THIRD PLANNING MEETING FOR THE MONSOON EXPERIMENT (MONEX) Global Atmospheric Research Program
1977 139 p refs Conf. held at New Delhi, Feb./Mar. 1977 Prepared jointly with ICSU, Rome
(GARP-Spec-Rept-25) Avail: NTIS HC A07/MF A01; WMO, Geneva

The purpose of the meeting was to define the scientific and observational objectives of the project, to evaluate the potential contributions of the participating countries, and to develop an organizational plan for management of the experiment. The current monsoon sub-program activities are reported and the observational program is outlined. The data management system is described together with the oceanographic program. ESA

N78-20725# World Meteorological Organization, Geneva (Switzerland).
THE USE OF SATELLITE IMAGERY IN TROPICAL CYCLONE ANALYSIS
1977 96 p refs
(WMO-473; WMO-TN-153; ISBN-92-63-10473-5) Avail: NTIS HC A05/MF A01; WMO, Geneva

A technique for the interpretation of images of tropical cyclones obtained from meteorological satellites is described. It is based on certain cloud patterns and measurable cloud features. Factors affecting satellite picture interpretation are discussed together with the accuracy of the technique. ESA

N78-20726# World Meteorological Organization, Geneva (Switzerland).
FORECASTING TECHNIQUES OF CLEAR-AIR TURBULENCE INCLUDING THAT ASSOCIATED WITH MOUNTAIN WAVES
Robert H. Hopkins 1977 41 p refs
(WMO-482; WMO-TN-155; ISBN-92-63-10482-4) Avail: NTIS HC A03/MF A01; WMO, Geneva

The operational significance of clear air turbulence (CAT) and the operational accuracy required for aeronautical purposes is reviewed. A description of CAT and its causes are presented together with the problems of forecasting different types of CAT. ESA

N78-20727# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH: NINTH STATUS REPORT ON IMPLEMENTATION GARP Global Experiment
1977 157 p refs Original contains color illustrations
(WMO-484; ISBN-92-63-10484-0) Avail: NTIS HC A08/MF A01; WMO, Geneva

The state of implementation of the World Weather Watch (WWW) plan in each of the three systems (global observing system, global data processing system, and global telecommunications system) and the improvements which may be expected in the years to come are summarized. The monitoring of the operation of the WWW is outlined together with the use of WWW facilities for operational hydrology. ESA

N78-20728# World Meteorological Organization, Geneva (Switzerland).
GUIDE ON THE GLOBAL OBSERVING SYSTEM
1977 100 p refs
(WMO-488; ISBN-92-63-10488-3) Avail: NTIS HC A05/MF A01; WMO, Geneva

The purpose and principles of the Global Observing System (GOS), one of the main components of the World Weather Watch, are outlined. The requirements for observational data on a global, regional, and national basis are reviewed. The essential elements of the GOS - the surface-based subsystem and the space-based subsystem - are described in detail. Data reduction is discussed together with quality control. Monitoring of the operation by the WWW is also noted. ESA

N78-20729# North Dakota Univ., Grand Forks. Dept. of Aviation.
HIPLEX RADAR SUPPORT, DIGITAL RADAR DATA PROCESSING DESIGN AND DOWNWIND MONITORING. WEATHER MODIFICATION ACTIVITIES IN NORTH DAKOTA, SOUTH DAKOTA, AND MINNESOTA FROM 1951 THROUGH 1976. PART 1: AN HISTORICAL OVERVIEW. PART 2: DESCRIPTIVE SUMMARY OF EACH PROJECT Special Report, Apr. - Jul. 1977
Martin R. Schock Sep. 1977 127 p refs
(Contract Contract DI-14-06-D-7581)
(PB-275669/0; UND/DA-77/4-Pt-1; UND/DA-77/4-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 04B

All weather modification projects occurring over North Dakota, South Dakota, and Minnesota for the period of years 1951 through 1976 were identified. An awareness of these activities will help to: (1) place into perspective the development of weather modification in these three states; (2) assist with the administrative planning and technical design of future projects; and, (3) provide a background of information useful for designing evaluation schemes for future projects. GRA

N78-20730# National Center for Atmospheric Research, Boulder, Colo.
REPORT OF INFORMAL WORKING MEETING US WINTER MONEX
J. P. Kuettner, ed. and W. C. Bolhofer, ed. Oct. 1977 103 p Meeting held at Boulder, Colo., 21-23 Jun. 1977
(Grant NSF ATM-77-23757)
(PB-275731/8; USMPO/NCAR-7511-77-1) Avail: NTIS HC A06/MF A01 CSCL 04B

The discussions of an informal working meeting of U.S. scientists interested in the winter monsoon were summarized. The meeting aimed to arrive at a well-defined set of U.S. scientific objectives and observational requirements and an estimate of potential U.S. participation in Winter MONEX. Participants also discussed data requirements, i.e., the meteorological parameters to be measured and their accuracy and resolution in time and space in order to ascertain the suitability and availability of special measuring systems and platforms. GRA

N78-20731# National Center for Atmospheric Research, Boulder, Colo.
UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH - NATIONAL CENTER FOR ATMOSPHERIC RESEARCH Annual Report, FY 1976
Apr. 1977 169 p refs
(Grant NSF ATM-72-10157)
(PB-275741/7; NCAR/AR-76) Avail: NTIS HC A08/MF A01 CSCL 04B

Ongoing research activities and significant recent achievements of this national laboratory are described. Topics include the following: Numerical Weather Prediction Project; GATE and GADMAP; Empirical Studies Project; Small-Scale Analysis and Prediction Project; Climate Project; Oceanography Project; GCM Coordination and Operations Group; National Hail Research Experiment; Advanced Study Program; High Altitude Observatory; Aerosol Project; Upper Atmosphere Project; Computing Facility; Research Aviation Facility; Field Observing Facility; Research Systems Facility; National Scientific Balloon Facility; Global Atmospheric Measurements Program; NCAR Administrative Structure. GRA

N78-20732# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
FEASIBILITY OF MONITORING AEROSOL CONCENTRATIONS BY 10.6-MICROMETER BACKSCATTER LIDAR
Gordon Lerfald May 1977 19 p refs
(PB-276389/4; NOAA-TR-ERL-387-WPL-50;
NOAA-77112810) Avail: NTIS HC A02/MF A01 CSCL 04B

A prototype lidar system was built and was operated in conjuction with equipment that permitted direct measurement of particle size distribution of aerosols in essentially the same sampled volume. The backscattered signals measured by the test system agreed to within a factor of two with the backscatter

computed from the measured particle size distributions. The experimental results were used to predict the performance of systems having transmitter powers and receiver collecting optics different from those used for the test system. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N78-20733 California Univ., San Diego.
EASTERN OCEAN RESPONSE TO CHANGING WIND SYSTEMS Ph.D. Thesis
Julian Percival McCreary, Jr. 1977 164 p
Avail: Univ. Microfilms Order No. 7802110

A simple, linear, analytic model is used to follow the response of an eastern ocean to different distributions of interior wind stress change. Linear solutions at a western ocean boundary quickly develop narrow intense coastal jets, for which nonlinear terms are obviously important. So, that region of the ocean is avoided here. It is possible to interpret the response of the model as a superposition of horizontally propagating vertical modes. For background density profiles typical of the tropical Pacific Ocean, the first baroclinic mode contains most of the variance of the model, and a reasonable representation of the complete response considers that mode alone. Dissert. Abstr.

N78-20734 California Univ., San Diego.
HYDROTHERMAL ACTIVITY AND NEAR-AXIS STRUCTURE AT MID-OCEAN SPREADING CENTERS Ph.D. Thesis
Kathleen Crane 1977 297 p
Avail: Univ. Microfilms Order No. 7802104

The following five midocean spreading centers were the sites for near-bottom combined hydrothermal and structural surveys: (a) the Reykjanes Ridge, (b) the western Charlie-Gibbs Transform Fault-Reykjanes Ridge intersection, (c) the East Pacific Rise, (d) the Galapagos Spreading Center, and (e) the western Siqueiros Transform Fault-EPR intersection. Of these five surveys, two show clear indication of hydrothermal activity. The surveys at the Siqueiros and the Charlie-Gibbs infer that warm water patches could result from hydrothermal activity at the junction of the rise crests with the transform fault zones of shear. The survey at the Reykjanes ridge was not very dense and thus many hydrographic interpretations may be used to explain the distributions of the water temperatures. Dissert. Abstr.

N78-20735 Princeton Univ., N. J.
AN EXPERIMENTAL STUDY OF DECAYING AND DIFFUSING TURBULENCE IN NEUTRAL AND STRATIFIED FLUIDS Ph.D. Thesis
Tommy De Dickey 1977 148 p
Avail: Univ. Microfilms Order No. 78-00260

Streak photographs of neutrally buoyant particles and a photo-digitizing system were employed for velocity measurements, while conductivity probes were used for density measurements. Two point turbulence velocity correlation measurements were used to determine the integral length scale and a method of evaluating dissipation from these correlations is presented. The study of stationary diffusing turbulence in a neutral fluid indicated that the integral length scale increased with depth while the dissipation rate decreased with depth. Evaluation of terms in the energy budget indicate an apparent balance between pressure diffusion and dissipation. Quasi-stationary diffusing turbulence was analyzed for the situation of an evolving mixed layer in an initially linearly stratified fluid. Dissert. Abstr.

N78-20736 Maryland Univ., College Park.
A NUMERICAL MODEL OF WIND AND WAVE GENERATED LANGMUIR CIRCULATIONS Ph.D. Thesis
Curtis Dale Mobley 1977 186 p
Avail: Univ. Microfilms Order No. 78-00376

This model carries out a finite difference solution of the time dependent, three-dimensional nonlinear Navier-Stokes equations. Boundary conditions were chosen to simulate an infinitely long fluid volume with periodic lateral boundaries and a free surface. The free surface can support propagating gravity waves and time and space dependent wind stresses can be applied at this surface. A particular wave and wind stress pattern capable of producing Langmuir circulations in the model is described. It was found that the circulations appear if and only if there is a certain correlation between the surface gravity wave pattern and the transverse wind stress component. The circulations were then further investigated using a simplified two-dimensional model. It was found that the circulations grow linearly with time, and depend linearly upon the wave amplitude and wind stress magnitude. Dissert. Abstr.

N78-20737 California Univ., San Diego.
THE SEPARATION OF WAVE-INDUCED AND INTRUSIVE OCEANIC FINE STRUCTURE Ph.D. Thesis
Charles Leslie Johnson 1977 104 p
Avail: Univ. Microfilms Order No. 7832810

In two widely separated regions of the North Pacific, experiments were run in an attempt at a clear separation of the internal wave and intrusive influences in oceanic fine structure. A conductivity/temperature/pressure instrument was repeatedly raised and lowered to varying depths above 1000 meters. Fine structure measurements made on two separate days of vastly differing surface conditions were analyzed to determine the spectral levels of fine structure induced by internal wave straining and by a passive distortion of the T-S relationship. On a day of moderate sea and wind, spatial evolution of successive profiles in space show ubiquitous steps and layers. Comparisons of displacement profiles inferred from the temperature and density signals indicate wave-induced fine structure dominance for all vertical scales down to 3 meters, beyond which instrument resolution was sufficiently poor to limit a structure separation at these scales. Dissert. Abstr.

N78-20738# Georgia Marine Science Center, Savannah.
GEORGIA'S COASTAL ZONE: AN INVENTORY OF PHOTOGRAPHIC AND SATELLITE COVERAGE 1945-1977
Robert J. Reimold and Ronald Keeler 1977 49 p Prepared in cooperation with Georgia Univ., Brunswick, Ga.
(PB-275356/4; TR-77-5) Avail: NTIS HC A03/MF A01 CSCL 08B

The numerous aerial surveys and LANDSAT images that are available for the six coastal counties of Georgia are summarized. The aerial photographic surveys that were completed since 1945 are listed as well as the LANDSAT coverage of the region. The surveys are categorized by county and subclassified by date. Each of the entries identifies: (1) the date; (2) percentage of coverage of the county; (3) type of film; (4) scale; (5) agency that conducted the survey; (6) project identification number; and (7) map indicating the location of the flight. Entire surveys are enumerated. GRA

N78-20739# Webb Inst. of Naval Architecture, Glen Cove, N.Y. Center for Maritime Studies.
ANALYSIS OF WAVE DATA FROM COBB SEAMOUNT (46 DEGREES N, 130 DEGREES W)
David A. Walden and Dan Hoffman Jul. 1977 74 p refs
(PB-275742/5; NMRC-KP-175) Avail: NTIS HC A04/MF A01 CSCL 08E

A spectral family of the Cobb Seamount Data is shown and compared with similar data previously derived from wave records at Station Papa (50 deg N, 145 deg W). A systematic shift toward lower frequency in the Seamount wave spectra is shown, and it is recommended that additional investigation should be extended to account for this shift. Author

N78-20740# Hawaii Inst. of Geophysics, Honolulu.
OCEAN BOTTOM SEISMOMETER GIMBAL SYSTEMS
David A. Byrne and William N. Ichinose Nov. 1977 8 p Submitted for publication
(Contract N00014-75-C-0209)
(AD-A050470; HIG-CONTRIB-853) Avail: NTIS HC A02/MF A01 CSCL 17/10

The Hawaii Institute of Geophysics has developed two major exploration ocean bottom seismometer systems. One operates as a free vertical pop-up ocean bottom seismometer and the other is a larger, tethered, ocean bottom seismometer. In both instruments it is necessary to maintain proper orientation of the

geophones while the instrument is operating. This proper orientation is maintained by gimballing the geophones. GRA

N78-20741# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
A TRANSFORMATION RELATING TEMPORAL AND SPACIAL SPECTRA OF TURBULENT KINETIC ENERGY
W. C. Thacker Feb. 1977 14 p refs
(PB-276392/8; NOAA-TR-ERL-385; AOML-26; NOAA-77112901) Avail: NTIS HC A02/MF A01 CSCL 08C

An eddy diffusivity was appropriate when scales of the flow smaller than a length l and t were unresolved. Heisenberg's theory for eddy diffusivity was used to obtain the connection between l and t necessary to transform temporal spectra into spatial spectra. This transformation revealed a close connection between the side D spectrum of turbulent kinetic energy in the ocean and diagrams of oceanic mixing. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N78-20742# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES
31 Mar. 1978 67 p refs Transl. into ENGLISH from various Russian journals
(JPRS-70876) Copyright. Avail: Issuing Activity

Recent Soviet activity in oncology, physiology, psychophysiology, and aerospace medicine are discussed as well as methods for dosimetry near atomic power plants. Norms for buildings and other structures used in animal husbandry, poultry breeding and fur farming are also considered. For individual titles, see N78-20743 through N78-20744.

N78-20743# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE **c52**
O. G. Gazenko and A. S. Ushakov *In its* Transl. on USSR Sci. and Technol. (JPRS-70876) 31 Mar. 1978 p 1-9 refs Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 6, 1977 p 30-35 (For availability see N78-20742 11-51)
Copyright. Avail: Issuing Activity

The relation of space medicine to bioastronautics and its associated fields (exobiology, ecophysiology, and biotechnology) is discussed with emphasis on investigations to determine the effects of weightlessness, patterns of evolution of living matter in the universe, and the conditions and performance of man in space. Benefits derived from data obtained during Skylab, Salyut, and Apollo-Soyuz missions are summarized. A.R.H.

N78-20744# Joint Publications Research Service, Arlington, Va.
PILOT RETRAINING AIMED AT STRESS REDUCTION **c53**
V. Gnusarkov *In its* Transl. on USSR Sci. and Technol. (JPRS-70876) 31 Mar. 1978 p 61-64 refs Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 1, 1978 p 26-27 (For availability see N78-20742 11-51)
Copyright. Avail: Issuing Activity

Occupational, moral-political, and psychological preparedness are criteria used in assessing pilots and in selecting the first candidates for training in the use of complex equipment and armament on new Soviet combat aircraft. Methods for reducing the psychological and psychophysical difficulties associated with retraining, and for maintaining mental stability under stressful conditions are described. A.R.H.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N78-20745 California Univ., Berkeley.
INFLUENCE OF METABOLIC RATE UPON THE METABOLISM OF LACTIC ACID AND THE OXIDATION OF GLUCOSE, ALANINE AND LEUCINE Ph.D. Thesis
Timothy Peter White 1977 228 p
Avail: Univ. Microfilms Order No. 77-31586

A rapid flow, open circuit indirect calorimeter was developed, validated and applied to the investigation of the metabolic responses of rats to rest and treadmill running at selected speeds and grades. These data indicated that the metabolic responses of rats were predictable on the basis of running speed and grade. The metabolic responses to increments in speed were much greater than to increments in grade. The calorimeter was used to test the traditional concept that when caloric supply was adequate, the metabolic demands of exercise were met by catabolism of carbohydrates and lipids. Using pulse infusions of carbon 14 tracers in rats, the influences of metabolic rate upon the oxidations of glucose, alanine and leucine were studied. Findings are discussed in regard to the integration of lactate with the overall carbon flow during exercise, and the energetics of muscular work. Dissert. Abstr.

N78-20746 Massachusetts Univ., Amherst.
THE EFFECT OF AGE AND ACTIVITY LEVEL ON FRACTIONATED RESPONSE AND REFLEX TIME Ph.D. Thesis
Priscilla Massei Clarkson 1977 209 p
Avail: Univ. Microfilms Order No. 77-30605

Male subjects were divided equally into four groups: old active, old inactive, young active, and young inactive. Subjects reported for two testing days and were measured under four different conditions; simple response time with only one stimulus, choice response time with three stimuli, and simple and choice resisted conditions. Resistance was applied to the reaction task by utilizing an electromagnet placed directly below the subject's heel. The magnet was set to produce a resistance equal to 10 percent of the subject's maximum isometric knee extension strength. Also measured were the fractionated components of normal and Jendrassik patellar reflex time which includes total reflex time, reflex latency, and reflex motor time. Of particular interest was the fact that virtually no decrement was found in speed of reflex time due to age. Dissert. Abstr.

N78-20747 Indiana Univ., Bloomington.
THE PHYSIOLOGY OF RESTRICTED BREATHING Ph.D. Thesis
Robert George McMurray 1977 163 p
Avail: Univ. Microfilms Order No. 77-30304

The problem was to determine whether hypoxic training, restricted breathing exercise, is in fact hypoxic. Restricted breathing rest and exercise were also compared to normoxic, eupnic breathing rest and exercise to evaluate any possible similarities. Furthermore, restricted breathing exercise was compared to the information in available literature on hypercapnia to note any similarities. The results of the study suggest the hypoxic training, restricted breathing exercise, is not truly hypoxic-hypoxia. Restricted breathing exercise increases P sub a sub CO2 but not total CO2, and is therefore not truly hypercapnic. The major benefit of restricted breathing exercise is an increased respiratory efficiency. With the exception of the aforementioned parameters, restricted breathing and eupnic breathing exercise are similar. Dissert. Abstr.

N78-20748 Texas A&M Univ., College Station.
DYNAMIC BEHAVIOR OF THE VISUAL TRACT Ph.D. Thesis
Robert Elvin Bretz 1977 118 p
Avail: Univ. Microfilms Order No. 77-32145

Transient frequency response (TFR) functions for the functional segment of the visual tract between the structures which produce the electroretinogram (ERG) and those which produce the visual evoked response (VER) were obtained using rabbits as an experimental subject. The technique used a light flash to perturb the system and considered the resultant ERG as the system input and the VER as the system output. A fast Fourier transform algorithm was used to transform the biopotential signals to the frequency domain. The luminance phase TFR functions exhibited linear properties above and below a transition level of background

illuminance, indicating the existence of a photopic and a scotopic system. A block diagram model is presented. Dissert. Abstr.

N78-20749 Pennsylvania Univ., Philadelphia.
A NEW APPROACH TO VENTRICULAR DYNAMICS: THE FLOW-PULSE RESPONSE Ph.D. Thesis
William Corson Hunter 1977 322 p
Avail: Univ. Microfilms Order No. 77-30206

A systems engineering approach was used to develop the pulse response method for studying the mechanical properties of the left ventricle. Ventricular responses were measured by applying narrow flow pulses to isovolumically beating hearts, superimposing the flow pulse beat and the isovolumic beat and computing the change in pressure throughout the systole. The elastic, resistive, and nonlinear components exhibited by the pulse response are discussed. Dissert. Abstr.

N78-20750 Iowa Univ., Iowa City.
THE CONFIGURATION OF MOVEMENT OF THE SEMICIRCULAR CANAL CUPULA Ph.D. Thesis
Jay William McLaren 1977 126 p
Avail: Univ. Microfilms Order No. 77-28488

A new technique was developed to mark the normally transparent cupula of the bullfrog horizontal semicircular canal. A glass micropipette was inserted through the bulk of the cupula, from apex to crista, and withdrawn with a simultaneous pressure injection of oil droplets that had been darkened with Sudan black. The positions of these droplets were measured relative to the ampulla using frame analysis of high speed motion pictures that were made during: (1) compression of the canal wall; and (2) sinusoidal rotation of the frog. In a parallel experiment single unit afferent activity was recorded during sinusoidal rotation from three areas of the horizontal ampullary nerve which innervated the narrow end, planar center, and planar end of the crista. Response characteristics were measured and related to the observed configuration of displacement of the cupula.
Dissert. Abstr.

N78-20751 Maryland Univ., College Park.
THE MEASUREMENT OF ACOUSTICAL PARAMETERS AND TRANSDUCER ACCELERATIONS IN PULSATILE ECHO-ENCEPHALOGRAPHY Ph.D. Thesis
Thomas David Smith 1977 136 p
Avail: Univ. Microfilms Order No. 77-29138

A technique is described whereby an individual echo signal in the presence of others can be selectively removed and processed to yield a recording of the pulsation signal, and a measure of the mean value of the echo signal. Because of a transducer calibration method described, calibration of the associated ultrasonic system allows conversion of the sured mean value of its equivalent acoustic sound pressure level. The data thereby obtained are then normalized by means of certain analysis techniques discussed. It is shown that under certain conditions, the transducer motion can greatly increase the amplitude of the signal. Data are also presented to show that the pulsatile signal persists in spite of minimized transducer motion, although somewhat reduced in amplitude from that previously observed. Attenuation and target strength measurements are also used in order to determine a comparison between the reflective properties of the brain's reflective surface and those of known reflective properties. Dissert. Abstr.

N78-20752 Virginia Polytechnic Inst. and State Univ., Blacksburg.
TEMPORAL ENCODING IN THE VISUAL SYSTEM Ph.D. Thesis
Maier Almagor 1977 121 p
Avail: Univ. Microfilms Order No. 7801575

A model for temporal and spatial encoding in the visual system is developed and presented. The model indicates that spatial information is encoded in a manner similar to the encoding of temporal information. The obtained results support the proposed model. The principal findings are: (1) Time integration of the eye is locally controlled and set across the retina and has very fast dynamics. (2) The obtained CFF curves suggest a correlation between the frequency at which maximum sensitivity is obtained and the sensitivity itself. (3) As predicted by the model, temporal bands are developed in the visual system for stimuli showing temporal discontinuity points. The width of the temporal bands was measured and a strong correlation was found between the temporal band width and the integration time. The width of the temporal bands is a function of the luminance level at which they are produced; it is not dependent on the stimulus slope. The apparent brightness of the temporal band is, however, dependent on the slope of the stimulus. Dissert. Abstr.

N78-20753 Stanford Univ., Calif.
TOTALLY IMPLANTABLE BIDIRECTIONAL PULSED DOPPLER BLOOD FLOW TELEMETRY: INTEGRATED ULTRASONIC RECEIVER, DIAMETER DETECTION, AND VOLUME FLOW ESTIMATION Ph.D. Thesis
James Walter Knutti 1977 207 p
Avail: Univ. Microfilms Order No. 7802184

Although animal models have been a valuable tool in medical research, their full potential for investigating physiological mechanisms and responses to treatment techniques has been limited by a lack of adequate chronic instrumentation. A totally implantable bidirectional pulsed Doppler ultrasonic blood flowmeter has been developed to meet this need by determining blood velocity as a function of range, vessel diameter, and volume flow on a long-term basis in deep-body vessels. A custom-receiver integrated circuit (IC) is a key element in the implanted package. Doppler frequency shifts of the ultrasonic signal backscattered to the transducer are detected, and quadrature components are multiplexed by this IC for bidirectional velocity estimation. Demultiplexing and demodulating this signal by the external electronics converted it to physiological information. Analysis of alternative system configurations, integrated-circuit designs, multiplexing approaches, and telemetry techniques identifies the optimal realization of the flow-meter. Dissert. Abstr.

N78-20754 Northeastern Univ., Boston, Mass.
CARDIAC OUTPUT AND AORTIC-PULMONARY SHUNT STUDIES Ph.D. Thesis
Arnold Marvin Aaron 1977 610 p
Avail: Univ. Microfilms Order No. 7800288

The work involves three distinct areas of study in the measurement of blood flow. First, an analog computer simulation of mass transport through the circulation was constructed. Second, an experimental study was undertaken to compare three competitive techniques for measuring cardiac output: (1) a square wave electromagnetic flowmeter (EMF), (2) a 'withdrawal cuvette' indicator dilution technique, and (3) the flow and pressures were studied in dogs with experimentally induced ascending aorta to right pulmonary artery fistulas. Dissert. Abstr.

N78-20755*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TOXIC SUBSTANCES ALERT PROGRAM
Thomas L. Junod Jan. 1978 287 p refs Revised
(NASA-TM-73866; E-9456) Avail: NTIS HC A13/MF A01 CSCL 06T

A toxicity profile is provided, of 187 toxic substances procured by NASA Lewis Research Center during a 3 1/2 year period, including 27 known or suspected carcinogens. The goal of the program is to assure that the center's health and safety personnel are aware of the procurement and use of toxic substances and to alert and inform the users of these materials as to the toxic characteristics and the control measures needed to ensure their safe use. The program also provides a continuing record of the toxic substances procured, who procured them, what other toxic substances the user has obtained in the past, and where similar materials have been used elsewhere at the center. Author

N78-20756*# Methodist Hospital, Houston, Tex.
EVALUATION OF THALLIUM-201 SCANNING FOR DETECTION OF LATENT CORONARY ARTERY DISEASE Final Report
Philip C. Johnson, Adrian LeBlanc, Lawrence Deboer, and Satish Jhingran [1978] 18 p refs
(Contract NAS9-15119)
(NASA-CR-151662) Avail: NTIS HC A02/MF A01 CSCL 06E

The use of thallium imaging as a noninvasive method to accurately screen shuttle passengers for latent coronary artery disease was investigated. All radionuclide procedures were

performed using an Anger type camera with a high resolution collimator. A minimum of 200,000 counts were collected for each image using a 20% window centered on the 69-83 keV X-rays. For the images obtained following injection with the patient at rest, the testing was begun 10 minutes after injection. Injections of TT during exercise were made at a point near the termination of the treadmill procedure as determined by either the appearance of ST segment changes on the electrocardiogram consistant with subendocardial ischemia, the appearance of angina-like chest pain in the patient or fatigue in the patient which required cessation of the test. The severity of heart disease was based on the medical history, physical exam, exercise electrocardiograms, chest X-rays and the coronary arteriogram. Author

N78-20757*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

EXPERIMENT REQUIREMENTS: VITAMIN D METABOLITES AND BONE DEMINERALIZATION, SPACELAB 2, EXPERIMENT NO. 1

Henrich K. Schnoes, Emily M. Holton, and Robert G. Thirolf Mar. 1978 22 p

(NASA-TM-79423; JSC-13933) Avail: NTIS HC A02/MF A01 CSCL 06P

As a contribution toward an understanding of the molecular basis of bone loss, mineral imbalance, and increasing fecal calcium under conditions of prolonged space flight, the blood levels of biologically active vitamin D metabolites of flight crew members will be quantitatively measured. Prior to the mission, the refinement of existing and the development of new techniques for the assay of all vitamin D metabolites will provide an arsenal of methods suitable for a wide range of metabolite levels. In terms of practical application, the analysis of human and animal plasma samples, Spacelab crew plasma samples, and flight hardware are envisioned. Author

N78-20758*# IIT Research Inst., Chicago, Ill. Management and Techno/Economic Services Section.

MARKET STUDY PHASE 2 FOLLOW-UP ACTIVITY. THE BAYLOR MARK 3 HAPLOSCOPE

Dec. 1977 23 p

(Contract NASw-2837)

(NASA-CR-156141) Avail: NTIS HC A02/MF A01 CSCL 06B

Efforts to accelerate commercialization of the haploscope, and to determine quickly and reliably the level of manufacturer interest in the product are presented. The nature of the decision making process within firms as it concerns project selection and new product evaluation is discussed. Implications for the NASA marketing program were assessed. Author

N78-20759# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

SOME CONTRIBUTIONS FROM THE RADIATION LABORATORY TO THE 20TH NATIONAL CONGRESS OF THE ITALIAN ASSOCIATION OF HEALTH PHYSICS AND RADIATION PROTECTION

25 Oct. 1977 40 p refs In ITALIAN; ENGLISH summary Proc. of Conf. held at Bologna, 26-28 Oct. 1977

(ISS-P-77/10) Avail: NTIS HC A03/MF A01

Some problems related to protection against ionizing and nonionizing radiations, as well as to some aspects of radiation dosimetry, are dealt with. Topics include radio protection and diagnosis with X-rays; primary medium energy standard; NEXT program for evaluating patient dosage; radiation emitted by color TV sets and by radar therapy equipment; and photodynamic effects induced in man by visible and near ultraviolet radiation. For individual titles, see N78-20760 through N78-20765.

N78-20760# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

RADIO PROTECTION AND DIAGNOSIS WITH X-RAYS [RADIOPROTEZIONE E DIAGNOSTICA CON RAGGI X]

P. L. Indovina and P. Salvadori *In its* Some Contrib. from the Radiation Lab. to the 20th Natl. Congr. of the Ital. Assoc. of Health Phys. and Radiation Protect. 25 Oct. 1977 p 1-6 refs In ITALIAN (For availability see N78-20759 11-52)

Avail: NTIS HC A03/MF A01

Preliminary results of an investigation into the number and the types of medical X-ray examinations in Italy in 1975 are presented and discussed. The data from Veneto, Friuli-Venezia Giulia, and Umbria regions, elaborated thus far, lead to the genetically significant dosage D = 40 mrem. ESA

N78-20761# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

PRIMARY MEDIUM ENERGY EXPOSURE STANDARD: COMPARISON BETWEEN ISS AND BIPM [STANDARD PRIMARIO DI ESPOSIZIONE A MEDIA ENERGIA: CONFRONTO FRA ISS E BIPM]

E. Casnati (Ferrara Univ., Italy), L. Pugliani, and P. Salvadori *In its* Some Contrib. from the Radiation Lab. to the 20th Natl. Congr. of the Ital. Assoc. of Health Phys. and Radiation Protect. 25 Oct. 1977 p 7-12 refs In ITALIAN (For availability see N78-20759 11-52)

Avail: NTIS HC A03/MF A01

The measuring exposure unit of the free air medium energy of the ISS was compared with the measuring unit of the BIPM chamber. The results are tabularized. ESA

N78-20762# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

NEXT PROGRAM FOR EVALUATING THE PATIENT DOSAGE: FIRST RESULTS FOR SOME X RAY DIAGNOSTICS INSTALLATIONS [PROGRAMMA NEXT PER UNA VALUTAZIONE DELLA DOSE DEL PAZIENTE: PRIMI RISULTATI PRESSO ALCUNI IMPIANTI DI DIAGNOSTICA CON RAGGI X]

A. Calicchia, A. Marchetti (CNEN, Rome), M. Paganini-Fioratti (CNEN, Rome) F. Baiocco (Umbrian Dept. of Social Serv.), P. Diloreto (Umbrian Dept. of Social Serv.), and P. Fratini (Umbrian Dept. of Social Serv.) *In its* Some Contrib. from the Radiation Lab. to the 20th Natl. Congr. of the Ital. Assoc. of Health Phys. and Radiation Protect. 25 Oct. 1977 p 13-18 refs In ITALIAN (For availability see N78-20759 11-52)

Avail: NTIS HC A03/MF A01

CNEN and Istituto Superiore di Sanita' have implemented the NEXT program for the determination of patient dosage following X-ray examination. After a pilot program, carried out on some typical installations to check the measuring and the calculation procedures, the program was presented to the health authorities of the various regions of Italy in May 1977. Some regions have declared themselves in a position to implement the program within a short time. The first results obtained for thorax, ascending pyelography, lumbar sacral, and anterior dental examinations are presented and discussed. ESA

N78-20763# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

USE OF THERMOLUMINESCENCE DOSIMETRY FOR MEASURING THE RADIATION EMITTED BY COLOR TV SETS [IMPIEGO DELLA DOSIMETRIA A TERMOLUMINESCENZA PER LA MISURA DELLE RADIAZIONI EMESSE DA TELEVISORI A COLORI]

A. Calicchia, A. Panigutti, and A. Rosati *In its* Some Contrib. from the Radiation Lab. to the 20th Natl. Congr. of the Ital. Assoc. of Health Phys. and Radiation Protect. 25 Oct. 1977 p 19-24 refs In ITALIAN (For availability see N78-20759 11-52)

Avail: NTIS HC A03/MF A01

The ionizing radiation emitted by some color television sets was measured using calcium fluoride thermoluminescence dosimetry (CaF2:Dy). The results are presented and discussed. For all TV sets the highest rates were obtained at the front surface. ESA

N78-20764# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

PHOTODYNAMIC EFFECTS INDUCED IN MAN BY SENSITIZERS AND VISIBLE RADIATION [EFFETTI FOTODINAMICI INDOTTI NELL'UOMO DA SENSIBILIZZANTI E DA RADIAZIONI VISIBILI]

S. Cannistraro *In its* Some Contrib. from the Radiation Lab. to the 20th Natl. Congr. of the Ital. Assoc. of Health Phys. and Radiation Protect. 25 Oct. 1977 p 25-30 refs In ITALIAN (For availability see N78-20759 11-52)

Avail: NTIS HC A03/MF A01

Those chemical substances used in medicine, cosmetics, and artificial colorants, or originating from modified physiological metabolisms that absorb visible or near ultraviolet radiation (320-700 nm), are liable to induce serious phototoxical and photoallergic reactions in man. At molecular level the absorption of radiation in the presence of oxygen causes photooxidation of the biological substrate according to two mechanisms (type I and type II). The photooxidation process is called photodynamic action. The various factors that influence the two processes are discussed; electronic paramagnetic resonance, spectroscopic techniques used to analyze them are presented; and the effects, on the entire photodynamic process, of some quenchers of the intermediate products are dealt with. The risks connected with the phototherapeutic use of furocoumarin derivatives (psoratene etc.) are discussed. ESA

N78-20765# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

ELECTROMAGNETIC FIELD LEVELS NEAR RADAR THERAPY EQUIPMENT [LIVELLI DI CAMPO ELETTROMAGNETICO ESISTENTI IN PROSSIMITA DI APPARATI PER RADARTERAPIA]

M. Grandolfo and C. Ranghiasci *In its* Some Contrib. from the Radiation Lab. to the 20th Natl. Congr. of the Ital. Assoc. of Health Phys. and Radiation Protect. 25 Oct. 1977 p 31-35 refs In ITALIAN (For availability see N78-20759 11-52)
Avail: NTIS HC A03/MF A01

The first results obtained by measuring the electromagnetic field level near radar therapy equipment (Siemens Radiotherm 306) operating at 2.45 GHz are presented. The angular distributions obtained with a Narda model 886-83 monitor show how it is possible to exceed the limit of 10 mW/m2, whose limit is among the highest mentioned in the regulations of various countries. The necessity of studying in greater detail field levels in the neighborhood of microwave equipment used for diathermy was confirmed. ESA

N78-20766# Duke Univ., Durham, N. C.

THE BIOMEDICAL EFFECTS OF THE HYPERBARIC ENVIRONMENT Final Technical Report, 1 Aug. 1974 - 31 Jul. 1977

J. Salzano, H. A. Saltzman, and E. Camporesi 5 Oct. 1977 6 p
(Contracts N00014-67-A-0251-0015; N00014-75-C-0223)
(AD-A047173) Avail: NTIS HC A02/MF A01 CSCL 06/19

Hyperbaric bradycardia was observed in 3 of 4 subjects at rest and during exercise at 5.5 Ata while breathing normoxic helium with a gas density equivalent to air at 1 Ata. The bradycardia was evident within 1 hour after reaching the simulated depth but was not present after 24 hours of exposure. Cardiac output at rest and during exercise after 24-48 hours at 5.5 Ata was not significantly different from the control values at 1 Ata; the bradycardia was not present at these times. Airway pressures during the first 100 msec of an occluded breath were greater at 5.5 Ata than at 1 Ata. The data indicate an increased respiratory center motor output at increased hydrostatic pressure. The response may be due either to the increased pressure or to inhalation of a gas with an increased density just prior to the occlusion. Hyperbaric bradycardia was not observed in five subjects after rapid compression to 5.5 Ata at which depth the subjects were breathing normoxic helium. Author (GRA)

N78-20767# Naval Medical Research Inst., Bethesda, Md.

HEAT STRESS, WORK FUNCTION AND PHYSIOLOGICAL HEAT EXPOSURE LIMITS IN MAN

A. R. Dasler Feb. 1977 32 p refs Presented at proceedings of Symp. on Thermal Anal.-Human Comfort-Indoor Environments, NBS, Gaithersburg, Md, 11 Feb. 1977
(AD-A050008) Avail: NTIS HC A03/MF A01 CSCL 06/19

Various operational trials using tolerance criteria available in the literature revealed that predictions of physiological exposure limits were rarely compatible with the observed status of men in a wide range of heat stress and work conditions. Computer integration of laboratory and industrial-type data led to establishing a comprehensive set of physiological criteria for tolerance limits appropriate to man at work within time-weighted-mean (twm) metabolic rates. These criteria and work rates were integrated with industrial-type heat stress conditions which resulted in developing the Physiological Heat Exposure Limits (PHEL) concept. Several electronic heat stress monitor-devices were evaluated and employed in determining environmental conditions. A comparison of over 200 sets of environmental and physiological data supported the PHEL concept and permitted more definitive identification of material areas requiring corrective engineering actions in the industrial-type settings. Corrective engineering actions based upon results of the data analyses have permitted nearly a sixfold increase of the maximum physiological exposure times; simultaneously, the estimated cardiovascular reserve increased from 15% to as much as 85% during routine work. GRA

N78-20768# Rochester Univ., N. Y. School of Medicine and Dentistry.

BIOLOGICAL EFFECTS OF LOW LEVELS OF RADIATION EXPOSURE

George W. Casarett 1977 29 p refs Presented at the Symp. on Public Health Aspects of Radioactivity in Consumer Products, Atlanta, 2-4 Feb. 1977
(Contract EY-76-C-02-3490)
(UR-3490-1072; Conf-770208-1) Avail: NTIS HC A03/MF A01

Some consumer products emit low linear energy transfer radiations beyond their confines and these penetrating radiations can result in whole body irradiations. Products may irradiate on the order of 10 to the 6th power to 10 to the 8th power people to average annual whole body or gonadal dose equivalents varying over a range on the order of 1 to 10 millirem (mrem). These include television receivers, time pieces with radium containing dials, gas and aerosol detectors, and building and road construction materials. On the order of 10,000 people may be irradiated by vacuum high voltage switches to 30 mrem or from electron microscopes to 300 mrem average annual whole body or gonadal dose equivalent. Possible health hazards are discussed. ERA

N78-20769# California Univ., Berkeley. Lawrence Berkeley Lab.

HEALTH AND SAFETY IMPACTS OF NUCLEAR, GEOTHERMAL, AND FOSSIL-FUEL ELECTRIC GENERATION IN CALIFORNIA. VOLUME 2: RADIOLOGICAL HEALTH AND RELATED STANDARDS FOR NUCLEAR POWER PLANTS

A. V. Nero and Y. C. Wong Jan. 1977 91 p refs
(Contracts W-7405-eng-48; CSERCDC-4-0123)
(LBL-5285-Vol-2) Avail: NTIS HC A05/MF A01

The status and basis of radiation protection standards, and how they particularly apply to nuclear power plants are presented. The national and international organizations involved in the setting of standards are discussed, paying explicit attention to their jurisdictions and to the considerations they use in setting standards. The routine and accidental radioactive emissions from nuclear plants are characterized, and the effect of these emissions on ambient radiation levels is discussed. The state of information on the relationship between radiation exposures and health effects is summarized. ERA

N78-20770# Naval Aerospace Medical Research Lab., New Orleans, La.

DYNAMIC RESPONSE OF HUMAN AND PRIMATE HEAD AND NECK TO Gy IMPACT STATEMENT Final Report, May 1974 - May 1976

C. L. Ewing, D. J. Thomas, L. Lustick, G. C. Willems, W. H. Muzzy, E. B. Becker, and M. E. Jessop Jan. 1978 758 p refs
(Contract DOT-HS-4-00852)
(PB-275448/9; DOT-HS-803058) Avail: NTIS HC A99/MF A01 CSCL 06S

A study of human and chimpanzee response to lateral (+Gy) impact acceleration with three dimensional inertial instrumentation of the head and of the first thoracic vertebral (T1) body was presented. Thirty-four human experiments using six volunteers are reported. Twelve chimpanzee experiments were conducted. The human lateral response is considerably different from the -Gx response previously reported. There are also major differences between human and chimpanzee response. The implications of the data for modeling and the validation of such models are discussed. Author

N78-20743# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE
O. G. Gazenko and A. S. Ushakov *In its* Transl. on USSR Sci. and Technol. (JPRS-70876) 31 Mar. 1978 p 1-9 refs Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 6, 1977 p 30-35 (For availability see N78-20742 11-51)
Copyright. Avail: Issuing Activity

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N78-20771# New Mexico State Univ., University Park. Dept. of Psychology.
INPUT, OUTPUT, AND RESPONSE BLOCKING IN IMMEDIATE RECALL Interim Technical Report
Warren H. Teichner Oct. 1977 50 p refs
(Contract F44620-76-C-0013; AF Proj. 2313)
(AD-A050302; NMSU-AFOSR-TR-77-2; AFOSR-78-0140TR)
Avail: NTIS HC A03/MF A01 CSCL 05/10

There are a large number of occasions in which the operator of a complex system must receive and remember a number of briefly displayed visual signals and respond to them appropriately. It is well-known that man's capacity for doing this is limited. Whether that limitation is on the input side of his ability to process information, i.e., to receive and to store in memory, or whether it is on the output side, i.e., to retrieve from memory and select actions, are not known although a great deal of current research and theory is devoted to the question. In this report a method is proposed for measuring the input and the output separately. In addition, by using two assumptions beyond the simple input-output model, the rate of processing of each and the source of loss of information can be determined for specified conditions. Operational definitions of input and output processing times and rates are presented based on a simple model of immediate recall. The temporal measures are then evaluated for the independence of their responsiveness to variables which affect the total processing time. It is concluded that the measures are useful and applicable to a wide variety of theoretical and practical problems. GRA

N78-20744# Joint Publications Research Service, Arlington, Va.
PILOT RETRAINING AIMED AT STRESS REDUCTION
V. Gnusarkov *In its* Transl. on USSR Sci. and Technol. (JPRS-70876) 31 Mar. 1978 p 61-64 refs Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 1, 1978 p 26-27 (For availability see N78-20742 11-51)
Copyright. Avail: Issuing Activity

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N78-20772 Virginia Univ., Charlottesville.
ANALYSIS AND SYNTHESIS OF A FLUID-POWERED INTELLIGENT INDUSTRIAL ROBOT END EFFECTOR WITH TACTILE SENSORS Ph.D. Thesis
Kenneth Alward Knowles, Jr. 1977 215 p
Avail: Univ. Microfilms Order No. 7800422

The design of an advanced microprocessor-controlled, sensor configured, pneumatic and hydraulic powered end effector for industrial manipulators is described. An initial review of existing teleoperators and robots points out the need for upgrading these devices. The development of a smart end effector is justified as significantly upgrading such manipulators. Basic end effector motions and senses are first defined, as well as a series of design and operational constraints. These are all used to establish loose specifications for the end effector design. Evaluation of various possible end effector configurations with respect to these specifications results in the choice of a linear motion, parallel finger configuration as the nucleus for the design. Sensors and additional motions are added to yield the final design.
Dissert. Abstr.

N78-20773*# Energy Research Corp., Danbury, Conn.
DEVELOPMENT OF A PROTOTYPE REGENERATION CARBON DIOXIDE ABSORBER Final Report, Jul. 1976 - Aug. 1977
Pinakin S. Patel and Bernard S. Baker 15 Oct. 1977 89 p refs
(Contract NAS2-9265)
(NASA-CR-152063) Avail: NTIS HC A05/MF A01 CSCL 06K

A prototype regenerable carbon dioxide absorber was developed to maintain the environmental quality of the portable life support system. The absorber works on the alkali metal carbonate-bicarbonate solid-gas reaction to remove carbon dioxide from the atmosphere. The prototype sorber module was designed, fabricated, and tested at simulated extravehicular activity conditions to arrive at optimum design. The unit maintains sorber outlet concentration below 5 mm Hg. An optimization study was made with respect to heat transfer, temperature control, sorbent utilization, sorber life and regenerability, and final size of the module. Important parameters influencing the capacity of the final absorber unit were identified and recommendations for improvement were made. Author

N78-20774# Canyon Research Group, Inc., Westlake Village, Calif.
DESIGN, ANALYSIS, AND INTERPRETATION OF SCREENING STUDIES FOR HUMAN FACTORS ENGINEERING RESEARCH Technical Report, Sep. 1976 - Sep. 1977
Charles W. Simon Sep. 1977 235 p refs
(Contract F44620-76-C-0008)
(AD-A050361; CWS-03-77; AFOSR-78-0055TR) Avail: NTIS HC A11/MF A01 CSCL 05/5

Methods are described for constructing Resolution IV screening designs that are robust to linear, quadratic, and cubic trend effects and will also keep the number of factor-level changes for some variables at a minimum. Complete designs, capable of screening up to 32 variables, are provided along with appropriate methods of analysis. Numerous criteria for selecting non-trivial variables are discussed, including: mean difference, eta squared, cumulative probability, and half-normal plots. How to handle subjects in an experiment is described when their characteristics can be included as experimental factors and when they cannot be, and when subjects are merely a form of replication. Lack-of-fit tests are provided to help decide whether a second- or a third-order response surface is needed. Numerous methods of analyzing screening studies with multiple responses are described. A method is given for developing a prediction equation with data collected from an incompleted screening design. GRA

N78-20775# Illinois Univ., Savoy. Aviation Research Lab.
THE EFFECTS OF PARTICIPATORY MODE AND TASK WORKLOAD ON THE DETECTION OF DYNAMIC SYSTEM FAILURES Interim Technical Report
Christopher D. Wickens and Colin Kessel Jun. 1977 47 p refs
(Contract F44620-76-C-0009)
(AD-A050210; ARL-77-8/AFOSR-77-7) Avail: NTIS HC A03/MF A01 CSCL 05/8

The ability of operators to detect step changes in the order of control dynamics is investigated as a joint function of (1) participatory mode: whether subjects are actively controlling those dynamics or are monitoring an autopilot controlling them, and (2) concurrent task workload. A theoretical analysis of detection in the two modes identifies factors that will favor detection in either mode. Five subjects either tracked or monitored the system dynamics on a 2-dimensional pursuit display under single task conditions and concurrently with a subcritical tracking task at two difficulty levels. Latency and accuracy of detection were assessed and related through a speed-accuracy tradeoff representation. Detection performance was faster, and only slightly less accurate in the manual as opposed to the

autopilot mode, and performance in each mode was derogated by the concurrent tracking requirement, but not by increases in loading task difficulty. Further analysis, involving multiple regression techniques, ensemble averaging and examination of response latency distributions suggested that manual superiority was attributable to the additional proprioceptive information resulting from control adaption to the system change. The effects of the loading task on detection and upon primary task tracking were interpreted in terms of the concept of limited processing resources. Author (GRA)

N78-20776# Naval Postgraduate School, Monterey, Calif.
HUMAN VERBAL BEHAVIOR CONSIDERATIONS IN THE DESIGN OF VOICE ACTUATED HARDWARE SYSTEMS M.S. Thesis
Anthony Gerald Quartano Sep. 1977 103 p refs
(AD-A049925) Avail: NTIS HC A06/MF A01 CSCL 05/7

An experimental study was made of the verbal behavior patterns of 15 P-3C and 15 non-P-3C aviators to determine a voice command vocabulary structure to be used with machine voice recognition hardware for implementation in P-3C aircraft. Subjects were required to give a one or two-word verbal command response to a visual slide stimulus of a simulated P-3C pilot's display. There were five distinct sets of slides, each portraying a different visual presentation. The subjects received the five sets in each of three blocks giving a total of 15 responses per subject. The verbal responses were recorded along with response latencies. Response latencies decreased for both groups as they progressed through the experiment with the P-3C group always having lower latency times. Both groups preferred using a two-word versus one-word command to describe changes on the visual display. Due to the different aviation backgrounds of the two groups, there was no uniform preference for a specific syntactic structure of the command phrases. The implications of the findings for the design of systems using vocal commands are discussed. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N78-20777 Pennsylvania Univ., Philadelphia.
WORLD MODEL DRIVEN RECOGNITION OF NATURAL SCENES Ph.D. Thesis
Kenneth Robert Sloan, Jr. 1977 269 p
Avail: Univ. Microfilms Order No. 77-30253

An Observer is developed for the recognition of natural scenes. The input to the Observer consists of a digitized color picture. The output is a description of the scene, based upon a World Model which directly drives the recognition process. The World Model consists of a set of nodes, with procedural elements (programs) attached at each node. These programs are invoked in a sequence which depends upon both the structure of the World Model and the nature of the scene. The nodes are explicitly grouped in packets which may be activated or deactivated according to decisions made at other nodes. This explicit grouping was found to be necessary due to both efficiency and system design considerations. Within packets, the nodes are implicitly ordered according to their 'information content'. This ordering allows for the possibility of making inferences based on partial information. Dissert. Abstr.

N78-20778 Syracuse Univ., N. Y.
A MULTIPLE ASSOCIATIVE-MEMORY SYSTEM FOR PIPELINING A DIRECTORY TO A VERY LARGE DATA BASE Ph.D. Thesis
Ashok Kumar Singhania 1977 166 p
Avail: Univ. Microfilms Order No. 77-30789

To satisfy the requirements of real time multiple attribute retrievals, utilization of a directory to the data base was assumed. A structure was then proposed for a directory that minimizes accesses to the data base in addition to allowing complex multiple key interrogations and being amenable to associative searching. The storage requirements for the proposed directory, which is hierarchical in nature, is shown to be quite modest, requiring a small fraction of the total data base storage space. Also proposed is a system architecture for a device utilizing a series of associative memory arrays that can be used to efficiently search the directory. The proposed architecture capitalizes on the time-disjoint hierarchy of operations involved in searching a multilevel directory by pipelining the search operations at the various levels and thus providing concurrency. Dissert. Abstr.

N78-20779 Syracuse Univ., N. Y.
ON RELIABLE COMPUTATION VIA NOISY DEVICES Ph.D. Thesis
Oguz Tosun 1977 110 p
Avail: Univ. Microfilms Order No. 77-30769

The performance of sophisticated codes in fault tolerant computer design was analyzed for best utilization of hardware redundancy. A different interpretation of the coding process is given by which simple replication is proven to be the origin of sophisticated codes. It was demonstrated that in computation systems, for a fixed cost, reliability cannot be improved arbitrarily by using more sophisticated codes as in communication systems. Two different computation models were considered. For the Load Sharing Parallel System model, simple replication was proven to be the best code to improve the reliability. The second model is the Multioutput System model for which some codes may perform better than simple replication. Dynamic decoding for triplication was considered and several techniques were proposed. Dissert. Abstr.

N78-20780 Stanford Univ., Calif.
PROGRAM BEHAVIOR AND THE PERFORMANCE OF MEMORY SYSTEMS Ph.D. Thesis
Bantwal Ramakrishna Rau 1977 250 p
Avail: Univ. Microfilms Order No. 78-02219

A systematic study was undertaken of the methodology for developing models of program reference strings. Various techniques were introduced to permit analysis of memory systems. A systematic classification of candidate models of program reference strings yields two broad classes -- observable models and partially observable models. Based on information theoretic arguments, a procedure was outlined for developing an observable model around a set of measurements. Three properties of the reference string, which substantially influence the performance of a memory hierarchy, are temporal locality, spatial locality and sequentiality. In a multiprocessor system, it was shown that program behavior is completely described by a first order Markov chain. A very accurate closed-form expression for the bandwidth is obtained when the Markov chain takes on a particular form. Dissert. Abstr.

N78-20781 Stanford Univ., Calif.
HARDWARE VERIFICATION Ph.D. Thesis
Todd Jeffry Wagner 1977 131 p

Avail: Univ. Microfilms Order No. 7802251

Methods for detecting logical errors in computer hardware designs using symbolic manipulation instead of digital simulation are discussed. A nonprocedural register transfer language is proposed that is suitable for describing how a digital circuit should perform. Transformations are presented which should enable the designer to either prove or disprove that the set of interconnected components correctly satisfy the specifications for the overall system. The problem of detecting timing anomalies such as races, hazards, and oscillations is addressed. Also explored are some relationships between the problems of hardware verification and program verification. Finally, the results of using an existing proof checking program on some digital circuits are presented.

Dissert. Abstr.

N78-20782*# Ohio Univ., Athens. Avionics Engineering Center.

MICROPROCESSOR-TO-SYSTEM/370 INTERFACE

Robert W. Lilley Feb. 1978 9 p ref

(Grant NGR-36-009-017)

(NASA-CR-156066; TM-NASA-55) Avail: NTIS HC A02/MF A01 CSCL 09B

The design and operation of a microprocessor interface unit which allows use of a computer terminal for communication at 110 or 300 baud both with a central host computer and with the microprocessor monitor are documented. Additionally, the interface permits the host computer to load the microprocessor memory directly with object code, avoiding the use of intermediate data storage such as paper tape. The central computer, containing an assembler language processor for the target microcomputer, can be used from the terminal with all the flexibility offered by the virtual machine facility, producing object code for the micro plus program listings and supporting outputs. The object code can then be loaded directly to the micro and the same terminal device used to run the micro program, communicating with the micro's monitor routine. Author

N78-20783# Naval Postgraduate School, Monterey, Calif.

ANALYSIS AND MODELLING OF POINT PROCESSES IN COMPUTER SCIENCE

P. A. W. Lewis and G. S. Shedler Sep. 1977 42 p refs

(AD-A050247; NPS55-77-38) Avail: NTIS HC A03/MF A01 CSCL 12/1

Models of univariate and multivariate series of events (point processes) and statistical methods for the analysis of point processes have diverse applications in the study of computer systems. These applications, which include the analysis and prediction of computer system reliability and the evaluation of computer system performance, are reviewed with emphasis on the latter. In addition recent results are described in the development of methodology for the statistical analysis of point processes. The analysis of multivariate point processes is much more difficult than that of univariate point processes, and that methodology has only recently been developed in a perforce fairly tentative manner. The applications to computer system data illustrate the need for new data analytic methods for handling large amounts of data, and the need for simple models for non-normal, positive multivariate time series. Some starts in these directions are indicated. GRA

N78-20784# PRC Information Sciences Co., McLean, Va.

RASTER TO LINEAL CONVERSION ANALYSIS, VOLUME 1 Final Technical Report, Jul. 1974 - May 1977

Richard L. Derrenbacher, Richard A. Nasci, and Walter H. Winter Dec. 1977 40 p refs

(Contract F30602-74-C-0334)

(AD-A050196; RADC-TR-77-421-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report addresses the strong and weak points of past efforts in raster to lineal processing and presents a solution for performing the conversion by reducing the volume and complexity of the data using a skeletonization algorithm. The resultant software system was written in FORTRAN for running on the Univac 1108. GRA

N78-20785# Federal COBOL Compiler Testing Service, Washington, D. C.

COBOL COMPILER VALIDATION Summary Report

15 Feb. 1978 34 p

(AD-A050282; CCVS68-VSR280) Avail: NTIS HC A03/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the Honeywell 2000 Series COBOL Compiler Version 4.02 OS/2000 Version 4.02, provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1968 COBOL Standard, X3.23-1968/Fips PUB 21-1. The compiler was validated at the High level of fips PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-19, a section relating the categories of discrepancies to each of the Federal levels of the language and a detailed listing of discrepancies together with the tests which were failed.

Author (GRA)

N78-20786# Federal COBOL Compiler Testing Service, Washington, D. C.

COBOL COMPILER VALIDATION Summary Report

15 Feb. 1978 84 p

(AD-A050283; CCVS74-VSR285) Avail: NTIS HC A05/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the Burroughs B6700/B7700 series COBOL Compiler Version II.9.1 (MCP Version II.9.1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the high level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-19, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed.

Author (GRA)

N78-20787# Maryland Univ., College Park. Computer Science Center.

A COMPARATIVE STUDY OF DIGITAL INTERPOLATION TECHNIQUES Interim Report

Edward A. Haser (Westinghouse Electric Corp., Baltimore, Md.) Nov. 1977 61 p refs

(Grant AF-AFOSR-3271-77; AF Proj. 2304)

(AD-A050321; TR-608; AFOSR-78-0177TR) Avail: NTIS HC A04/MF A01 CSCL 05/8

Interpolation has come into use in digital picture processing for many reasons. This paper is a report on the implementation and evaluation of four methods - replication, linear, cubic spline, and sinc function. The evaluation is based on mean square error calculations, visual rating, and computer usage costs. The results are limited but show that the best method depends upon the application for which it is used. Two side investigations were also conducted. The mean square error of an interpolated picture can be reduced if the picture is optimally sampled before interpolation. The results of an experiment bear this out. An interpolation method was extended to color pictures. The method proved feasible. Author (GRA)

N78-20788# Naval Intelligence Processing System Support Activity, Alexandria, Va. Systems Management Div.

INTEGRATED DATA BASE DEVELOPMENT AND DESIGN GUIDE, VERSION 1.1

L. E. Towner Dec. 1977 247 p

(AD-A050468) Avail: NTIS HC A11/MF A01 CSCL 05/2

The development of an integrated data base is an expensive and highly detailed project. The speed with which applications can be added or enhanced is directly proportional to the analysis resources available. The most time-consuming part of the analysis is the definition of the data elements and their relationships. Once this is done the remainder of the design effort falls rapidly into place. The Guide provides a step-by-step set of instructions which lead to a subsystem specification of the user's desired application. At the same time it will permit the user, who knows more about the data than anyone else, to perform the initial phases of the analysis. GRA

N78-20789# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

A DYNAMIC DEBUGGING SYSTEM FOR MDL

Joel Mayer Berez Jan. 1978 57 p refs

(Contract N00014-75-C-0661)

(AD-A050191; MIT-LCS-TM-94) Avail: NTIS HC A04/MF A01 CSCL 09/2

Program debugging is a time consuming process. Conventional debugging techniques and aids typically give the user a narrow view of the program's operation, making debugging difficult. A debugging system that would present a clear overall picture of a program's behavior and would be both flexible and simple to operate would be a valuable tool. Such a system was designed and implemented in and for MDL, a high-level applicative programming language. This report discusses: the design alternatives considered during the debugging system's design and implementation phases, the reasons for the resulting design choices, and the system attributes. A major attribute of the system (MEND) is that it does not simulate the program being debugged but instead monitors it from another process. This attribute results in a robust and viable debugging system, because MEND need not be modified in order to handle each new extension to MDL and/or each new user-defined primitive. Author (GRA)

N78-20790# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

CARNEGIE-MELLON UNIVERSITY MULTI-MICROPROCESSOR REVIEW Interim Report

S. H. Fuller, A. K. Jones, and I. Durham Jun. 1977 92 p

(Contracts F44620-73-C-0074; ARPA Order 2466)

(AD-A050135; AFOSR-78-0115TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

The CM* project has been in progress almost exactly two years. The present review is intended to critically examine our progress to date and evaluate our plans for the future of CM*. This report contains a description of the measurement and evaluation studies conducted. However, it was desirable to evaluate CM* as early in its development cycle as possible to detect and correct flaws in our design and understanding of this experimental multiprocessor. The present state of CM* is described and all of our current measurements tabulated so a diligent reader can study and evaluate for himself our recent results. GRA

N78-20791# Naval Postgraduate School, Monterey, Calif.

NTDS COMPUTER FACILITIES SCHEDULING SYSTEM Final Report

James K. Hartman and Gilbert T. Howard Dec. 1977 162 p

(AD-A050220; NPS55-77-45) Avail: NTIS HC A08/MF A01 CSCL 17/2

This report investigates the scheduling of Naval Tactical Data Systems (NTDS) mockups and the associated computer facilities at FCDSSA/FCDSTCP, San Diego. Provided is a design for an automated, computer based, interactive system for assisting in the management of job and equipment scheduling, equipment status recording, and equipment hookup. The decision logic of the scheduling portion of this system has been developed in detail, and a prototype scheduling program has been written and tested. The results indicate that the computer program can do a good job of producing a job schedule and the associated equipment assignments. A schedule for system implementation is also suggested. Author (GRA)

N78-20792# Naval Ship Research and Development Center, Bethesda, Md.

THE TEXAS INSTRUMENTS ADVANCED SCIENTIFIC COMPUTER AND ITS APPLICATION TO NUMERICAL FLUID DYNAMICS PROBLEMS

Paul E. Morawski Nov. 1977 35 p refs

(SR0140301)

(AD-A050222; DTNSRDC-77-0118) Avail: NTIS HC A03/MF A01 CSCL 20/4

This report evaluates both the hardware and software of the Texas Instruments Advanced Scientific Computer (TIASC) at the Naval Research Laboratory in terms of their applicability to numerical fluid dynamics calculations. DTNSRDC users access this computer via an on-site Remote Job Entry Terminal. The 'pipelined' central processor of the TIASC has been found particularly valuable in numerical fluid dynamics work, especially when combined with the graphics capabilities available at DTNSRDC. Several examples of fluid dynamics problems which were successfully solved using the TIASC are given. Author (GRA)

N78-20793# Washington Univ., Seattle. Dept. of Chemistry.

A LOW-COST, GENERAL PURPOSE DATA ACQUISITION AND CONTROL SYSTEM FOR THE PDP-11 MINICOMPUTER

J. D. S. Danielson, Steven D. Brown, Carl J. Appellof, and B. R. Kowalski 10 Feb. 1978 23 p refs

(Contract N00014-75-C-0536; NR Proj. 051-565)

(AD-A050224) Avail: NTIS HC A02/MF A01 CSCL 09/2

A general-purpose interface for the PDP-11 family of minicomputers is described. The interface, oriented towards laboratory data-acquisition and experimental control applications, can be built in a relatively short time with low materials costs. A general purpose, FORTRAN-compatible software package capable of driving the interface is also discussed. Author (GRA)

N78-20794# California Univ., Livermore. Lawrence Livermore Lab.

GENERALIZED MESSAGE RECOGNITION PROCEDURE FOR INTELLIGENT MINICOMPUTER SYSTEMS

J. E. Albert May 1977 11 p refs Presented at the 1st IEEE Intern. Computer Software and Appl. Conf., Chicago, 8 Nov. 1977

(Contract W-7405-eng-48)

(UCRL-79513; Conf-771111-1) Avail: NTIS HC A02/MF A01

A generalized technique for recognizing and evaluating variable length text streams is described. Messages are treated as patterns of characters, and the use of checksums and stream length is discussed as appropriate describing features. Various examples were provided. The advantages of this technique are its minimal drain on the available memory resources of minicomputers and its very fast recognition rates. ERA

N78-20795# National Physical Lab., Teddington (England). Div. of Computer Science.

THE EDSAC. NUMBER 3 IN A SERIES OF SPECIAL LECTURES ON THE PIONEERS OF COMPUTING

M. V. Wilkes Jun. 1977 13 p refs Sponsored by Computer Systems and Electron. Requirements Board

(NPL-COM-90) Avail: NTIS HC A02/MF A01

The early days of computing are discussed. The development of the EDSAC computer and the way it eventually came into practical use are described. ESA

N78-20796# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.

THE CLOTHESLINE STORE

J. L. Rodgers and D. Schofield Oct. 1977 13 p refs

(NPL-NAC-83) Avail: NTIS HC A02/MF A01

The Clothesline Store, which is described, is a new approach to computer storage which enables more fast access memory, operating sequentially rather than randomly, to be attached to a conventional computer in such a way that only a few main store addresses are required to access a large amount of Clothesline store. ESA

N78-20797# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.

HIGHLY RELIABLE RANDOM ACCESS SEMICONDUCTOR MEMORY FOR THE OBC (BREADBOARD MODEL) Final Report

C. J. Black Paris ESA Aug. 1977 195 p

(Contract ESTEC-2528/75-MP-SC)

(ESS/SS-817; ESA-CR(P)-1022) Avail: NTIS HC A09/MF A01

The study, design, and development of a highly reliable CMOS semiconductor random access memory are reported, and a breadboard version of the memory and its associated test equipment are described. Methods of error correction, selection of components, and packaging techniques were studied. A BK word breadboard memory, with double error correction, was designed and constructed. This breadboard memory was subjected

to functional tests, temperature tests, and integration tests with the ESTEC ON-Board Computer (OBC). It was demonstrated that the concept of a memory with the capability of double error correction can be translated into practical hardware with an acceptably, low impact on speed, power, and complexity. Compatibility with the ESTEC OBC was established.
Author (ESA)

N78-20798# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: AN ANALYSIS OF COMPUTER SECURITY SAFEGUARDS FOR DETECTING AND PREVENTING INTENTIONAL COMPUTER MISUSE Final Report
Brian Ruder (Stanford Res. Inst., Menlo Park, Calif.), J. D. Madden (Stanford Res. Inst., Menlo Park, Calif.), and Robert P. Blanc, ed. Jan. 1978 80 p refs
(PB-275514/8; NBS-Special-Pub-500-25; LC-77-25368) Avail: NTIS HC A05/MF A01 CSCL 09B

A working definition of intentional computer misuse, a construction of a vulnerability taxonomy of intentional computer misuse, a list of 88 computer safeguards, and a model for classifying the safeguards are provided. In addition, there are lists ranking prevention and detection safeguards, with an explanation of the method of approach used to arrive at the lists. This report should provide the computer security specialist with sufficient information to start or enhance a computer safeguard program. GRA

N78-20799# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: AN ARCHITECTURE FOR A ROBOT HIERARCHICAL CONTROL SYSTEM
Anthony J. Barbera Dec. 1977 230 p refs
(PB-275515/5; NBS-SP-500-23; LC-77-17960) Avail: NTIS HC A11/MF A01 CSCL 09B

Complex automation systems, such as industrial robots, require a computer based control system for the effective utilization of this advanced technology. This report describes such a control system. The approach has been to partition the control system into a hierarchy of different functional levels. This has proven to be a powerful technique in obtaining sensor-controlled robot behavior at a minimum cost of programming time and computer size. Further, this partitioning has greatly simplified the implementation of additional functions and sensors. This report discusses the control system, its implementation and use, and provides a documented listing of all of the control programs. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N78-20800 California Univ., Los Angeles.
CHARACTERISTICS OF THE HIGH COST OF MAINTENANCE OF APPLICATION SOFTWARE Ph.D. Thesis
Gerry Edward Tompkins 1977 296 p
Avail: Univ. Microfilms Order No. 7730963

A survey was conducted with a sample of 77 organizations involved with computer data processing. In particular, data were collected on some of the characteristics of application software maintenance as it is performed by the Systems and Programming department of each organization in the sample. A questionnaire was used as a data collection method and its contents divided into parts: part 1 - covering the Systems and Programming department of the responding organization; and part 2 - dealing with the technical and managerial aspects of an application system undergoing maintenance and enhancement. The analysis of the questionnaires indicated that the management factor was underestimated. In maintenance and enhancement, problems of a management orientation tended to be more significant than those of a technical orientation. Dissert. Abstr.

N78-20801 Alabama Univ., University.
A NEW ALGORITHM, AND THE EVALUATION OF CURRENT ALGORITHMS, CONCERNING GRAPH ISOMORPHISM Ph.D. Thesis
Virginia Charmane Perry May 1977 197 p
Avail: Univ. Microfilms Order No. 7800627

The algorithm implements a necessary and sufficient condition for the existence of an isomorphism between the two directed graphs based on the isomorphism between their corresponding Moore Sequential Machines (MSM). An algorithm is given which transforms any graph into a MSM. Both the MSM algorithm and the isomorphism algorithm are implemented using PL/1 and tested using regular and strongly regular graphs. An analysis of the theoretical and experimental bounds of both algorithms leads to the result that, while the algorithms are not guaranteed to run in polynomial time, they do perform efficiently for a large class of regular graphs. Dissert. Abstr.

N78-20802*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
A SIMULATION MODEL FOR WIND ENERGY STORAGE SYSTEMS. VOLUME 1: TECHNICAL REPORT Final Report
A. W. Warren, R. W. Edsinger, and Y. K. Chan Aug. 1977 101 p refs
(Contracts NAS3-20385; E(49-28)-1026)
(NASA-CR-135283; BCS-40180-1-Vol-1; CONS-038-5-1) Avail: NTIS HC A06/MF A01 CSCL 09B

A comprehensive computer program for the modeling of wind energy and storage systems utilizing any combination of five types of storage (pumped hydro, battery, thermal, flywheel and pneumatic) was developed. The level of detail of Simulation Model for Wind Energy Storage (SIMWEST) is consistent with a role of evaluating the economic feasibility as well as the general performance of wind energy systems. The software package consists of two basic programs and a library of system, environmental, and load components. The first program is a precompiler which generates computer models (in FORTRAN) of complex wind source storage application systems, from user specifications using the respective library components. The second program provides the techno-economic system analysis with the respective I/O, the integration of systems dynamics, and the iteration for conveyance of variables. SIMWEST program, as described, runs on the UNIVAC 1100 series computers. Author

N78-20803*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
A SIMULATION MODEL FOR WIND ENERGY STORAGE SYSTEMS. VOLUME 2: OPERATION MANUAL Final Report
A. W. Warren, R. W. Edsinger, and J. D. Burroughs Aug. 1977 421 p refs 3 Vol.
(Contracts NAS3-20385; E(49-28)-1026)
(NASA-CR-135284; BCS-40180-2-Vol-2; CONS-0385-2) Avail: NTIS HC A18/MF A01 CSCL 09B

A comprehensive computer program (SIMWEST) developed for the modeling of wind energy/storage systems utilizing any combination of five types of storage (pumped hydro, battery, thermal, flywheel, and pneumatic) is described. Features of the program include: a precompiler which generates computer models (in FORTRAN) of complex wind source/storage/application systems, from user specifications using the respective library components; a program which provides the techno-economic system analysis with the respective I/O the integration of system dynamics, and the iteration for conveyance of variables; and capability to evaluate economic feasibility as well as general performance of wind energy systems. The SIMWEST operation manual is presented and the usage of the SIMWEST program and the design of the library components are described. A number of example simulations intended to familiarize the user with the program's operation is given along with a listing of each SIMWEST library subroutine. Author

N78-20804*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
A SIMULATION MODEL FOR WIND ENERGY STORAGE SYSTEMS. VOLUME 3: PROGRAM DESCRIPTIONS Final Report
A. W. Warren, R. W. Edsinger, and J. D. Burroughs Aug. 1977 234 p 3 Vol.

(Contracts NAS3-20385; E(49-28)-1026)
(NASA-CR-135285; BCS-40180-3-Vol-3; CONS-0385-3) Avail: NTIS HC A11/MF A01 CSCL 09B

Program descriptions, flow charts, and program listings for the SIMWEST model generation program, the simulation program, the file maintenance program, and the printer plotter program are given. Author

N78-20805*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PHOTOMASK AND PATTERN PROGRAMMING MANUAL
R. K. Kirschman 1 Mar. 1978 96 p refs
(Contract NAS7-100)
(NASA-CR-156131; JPL-Pub-77-32) Avail: NTIS HC A05/MF A01 CSCL 09B

A user's manual for a set of computer programs written in FORTRAN for the layout and generation of photomasks is presented. A limited amount of related information on photomasks, their design, and use is included. Input to the programs includes data descibiing the photomask design. Possible outputs include plots of the layout and a magnetic tape for controlling generation of the photomask by a pattern generator. Author

N78-20806*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USER'S GUIDE TO SFTRAN/1100
William F. Ford and Theodore E. Fessler Apr. 1978 44 p refs
(NASA-TP-1200; E-9445) Avail: NTIS HC A03/MF A01 CSCL 09B

Extensions and improvements were made to SFTRAN, a structured programming language. This language was implemented as a precompiler that translates from SFTRAN to FORTRAN. It was available to batch and conversational users of the UNIVAC 1100 computer system. The SFTRAN language and its use are described. In addition, conversational time-sharing system command subroutines were implemented that eliminated the complications of dealing with extra files and processing steps that the use of a precompiler would otherwise require. These command subroutines are reported, and their use is illustrated by examples. Author

N78-20807# Stanford Univ., Calif. Dept. of Operations Research.
TWO-PHASE ALGORITHM FOR NONLINEAR CONSTRAINT PROBLEMS
J. B. Rosen Aug. 1977 27 p refs
(Contract N00014-75-C-0267)
(AD-A049684; TR-77-22) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm is described which solves the general nonlinear programming problem with nonlinear constraints. The computational implementation is based on the iterative use of any available package which solves the linearly constrained problem with a nonlinear objective function. Large, sparse problems with nonlinear constraints can be solved by this algorithm, provided a suitable linear constraint package is used. The algorithm consists of two phases. The first (Phase I) uses an external squared penalty function to find a point x(1), close to a local minimum. Starting with x(1), the algorithm then solves a sequence of linearly constrained problems (Phase II). Selected nonlinear constraints are linearized for each such Phase II iteration. With suitable assumptions, convergence from any initial point, with quadratic convergence in Phase II, is shown. The practical implementation of this algorithm is described, and its potential application to a model for the assessment of energy alternatives is discussed briefly. Author (GRA)

N78-20808# George Washington Univ., Washington, D. C. Inst. for Management Science and Engineering.
COMPUTING BOUNDS ON THE LOCATION OF AN ISOLATED LOCAL MINIMIZER Interim Report
Garth P. McCormick 6 Dec. 1977 19 p refs
(Grant AF-AFOSR-2504-73)
(AD-A050411; SERIAL-T-366; AFOSR-78-0151TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Conditions are given which verify the existence and determine the location of an isolated local constrained minimizer in a convex compact set. An exact formula is given for the amount by which the value of the objective function at some point differs from the value at that isolated point. Further conditions are given which ensure that the local minimizer is a global minimizer in the given convex compact set. Author (GRA)

N78-20809# Rensselaer Polytechnic Inst., Troy, N. Y. Computer Research Lab.
PROGRAMMER'S MANUAL FOR THE CHAP LINE-DRAWING PROCESSING LANGUAGE
H. Freeman, J. Paolicelli, and M. Potmesil Jun. 1977 89 p refs Revised
(Grants AF-AFOSR-2937-76; AF-AFOSR-2755-75)
(AD-A049710; CRL-52A; AFOSR-77-0103TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes CHAP, a computer language for processing line drawings represented in terms of the 8-direction chain code. The language consists of a set of FORTRAN subroutines, most of which are machine independent. The subroutines may be called by a user program to accomplish specific line-drawing processing tasks. The chain data are stored in packed (machine-dependent) form and are unpacked for processing. The report lists all currently available CHAP subroutines and provides all necessary information for a CHAP programmer. Specific information for different machine implementations are given in the appendices. Implementations exist for IBM 360, UNIVAC 1108/1110, CDC 6600, and ADAGE AGT 30/130. Versions for other machines can be readily generated. Author (GRA)

N78-20810# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DISTRIBUTED COMPUTATION AND TENEX-RELATED ACTIVITIES Quarterly Progress Report, 1 Feb. - 30 Apr. 1977
R. Schantz and R. Thomas Jan. 1978 47 p refs
(Contract N00014-75-C-0773)
(AD-A050190; BBN-3751; QPR-10) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes efforts in the design of the National Software Works system and efforts to integrate TENEX into the National Software Works system. GRA

N78-20811# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DISTRIBUTED COMPUTATION AND TENEX-RELATED ACTIVITIES Quarterly Progress Report, 1 May - 31 Jul. 1977
R. Schantz and Robert H. Thomas Jan. 1978 42 p
(Contract N00014-75-C-0773; ARPA Order 2935)
(AD-A050415; BBN-3752; QPR-11) Avail: NTIS HC A03/MF A01 CSCL 09/2

For abstract, see N78-20810.

N78-20812# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
A VITERBI ALGORITHM FOR MODULO-2 pi PHASE TRACKING IN COHERENT DATA COMMUNICATION SYSTEMS Interim Report
Louis L. Scharf and M. M. Siddiqui Dec. 1977 30 p refs
(Contract N00014-75-C-0518)
(AD-A049662; TR-25(ONR)) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is argued that only phase, modulo-2 pi, is of interest in data communication applications. The probabilistic evolution of random walk phase, modulo-2 pi, is studied and the results used to derive a MAP sequence estimator for phase on the interval (-pi, pi). The MAP sequence estimator is a Viterbi tracker (or dynamic programming algorithm) for tracking phase on a finite-dimensional trellis in (-pi, pi). Computational requirements are discussed and several representative simulations are included. Applications of the algorithm to carrier phase tracking in coherent data communication systems are outlined. Author (GRA)

N78-20813# New York Inst. of Technology, N. Y.
FUNCTIONAL SOFTWARE DEVELOPMENT Final Report
Melvyn M. Drossman 14 Nov. 1977 70 p refs
(Contract AF-AFOSR-3205-77; AF Proj. 2304)
(AD-A050294; AFOSR-78-0110TR) Avail: NTIS HC A04/MF A01 CSCL 09/2

Functional software development is a system for the

development of high-quality digital computer software. It has two components: functional design for design, and functional programming for program implementation. Functional design has been documented and the feasibility of functional programming is demonstrated. Functional design is a top-down graphical method based on the concepts of nested-virtual machines and matching program structure to data structure. Programs developed using these techniques consist of a set of functionally cohesive modules whose linkages are automatically handled by the language processor component of the functional programming system. As a result, they should be easily maintained and reliable.
Author (GRA)

N78-20814# University of Southern Calif., Los Angeles. Behavioral Technology Labs.
STUDIES OF VERBAL PROBLEM SOLVING. 1: TWO PERFORMANCE-AIDING PROGRAMS Technical Report, 1 Jul. - 30 Sep. 1977
Nicholas A. Bond, Joseph W. Rigney, and W. Gabrielli Sep. 1977 51 p refs
(Contract N00014-75-C-0838; ARPA Order 2284; RR0420601)
(AD-A047193; TR-83) Avail: NTIS HC A04/MF A01 CSCL 05/9

Two computer programs were written to provide on-line aiding to human problem solvers. Both programs were written in time-shared BASIC, and were designed for 'membership' problems. In this kind of problem, there are several English sentences and implicit in the sentences are various relations; the task is to infer a membership structure that is compatible with all the logical constraints. Membership problems may be cast in various settings, such as a murder mystery where a culprit is to be identified. One program (FIRST) was based on Findler's 'Universal Puzzle Solver' concept; the other (GABE) used Wang's theorem-prover logic. In both programs, the human operator converted English problem sentences to logical membership relations. The programs kept track of all relations entered, indicated when more data inputs were needed, and scored whether a correct answer was achieved. Of the two programs, FIRST appears to be most feasible with ordinary college subjects. It accepts logical inputs in a near-English format, and shows current logical status of a problem via tabular arrays of X's and O's. The present version of GABE used a strict 'p, q, r' logical notation; college subjects find this difficult and unsatisfactory. GRA

N78-20815# SRI International Corp., Menlo Park, Calif.
THE SEMIAUTOMATIC GENERATION OF INDUCTIVE ASSERTIONS FOR PROVING PROGRAM CORRECTNESS Interim Report, 1 Jul. 1974 - 30 Jun. 1977
Bernard Elspas, Robert S. Boyer, Karl N. Levitt, J. Strother Moore, and Lawrence Robinson Nov. 1977 127 p refs
(Contract F44620-73-C-0068)
(AD-A050154; AFOSR-78-0114TR) Avail: NTIS HC A07/MF A01 CSCL 09/2

This interim report describes progress on a project aimed at solving a serious problem that has been encountered in attempts to make program correctness proving a practical technique for software verification. The principal problem addressed here is the difficulty of synthesizing so-called loop assertions in connection with the main method now under study for program proving. Several rather diverse approaches, some of them constituting such alternatives to the present technique, are considered here: transformation of programs into primitive recursive form before verification, the method of generator induction for proof of properties of complex data structures, the use of a hierarchical design methodology to structure programs so as to minimize the need for loop assertions, and methods related to subgoal induction and computational induction. The two latter methods were analyzed in detail and compared with the present approach to arrive at a better understanding of their mutual relationships.
GRA

N78-20816# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF A USER INTERFACE WITH THE VECTOR GENERAL GRAPHICS DISPLAY SYSTEM M.S. Thesis
David C. Endicott and Nathan P. Martino Dec. 1977 200 p refs
(AD-A050241) Avail: NTIS HC A09/MF A01 CSCL 09/2

The development and implementation of refresh graphics software for the Vector General Display System on a PDP-11 minicomputer are discussed. Modification and expansion of existing software routines, along with additional software design and development are presented. As an addition to the existing C programming language, a version of BASIC was implemented as a second language capable of utilizing the Vector General software. The unsuccessful implementation of a version of FORTRAN with the display system software and the problems involved are discussed. Conclusions and recommendations are offered, and a detailed user's manual is appended. Author (GRA)

N78-20817# Weapons Research Establishment, Salisbury (Australia).
A FINITE-STATE PARSER FOR PDP-11 AND NOVA COMPUTERS
G. S. Brimble Jul. 1977 43 p refs
(AD-A048023; WRE-TR-1842(A)) Avail: NTIS HC A03/MF A01 CSCL 09/2

A method is described for creating computer programs to analyze text for compliance with a specified structure; examples of such programs are command decoders and format checkers. The paper shows how analysis programs are easily produced by constructing a table directly from a specification of the intended data format and presenting this as input to a non-specific parser subroutine which has been written and is described. Facilities are included to execute user-written subroutines when key structures are recognized in the input. Programs have been written in PDP-11 and NOVA assembly language to implement the parser, and instructions for use of these programs, examples and listings are included. Author (GRA)

N78-20818# Florida Univ., Gainesville. Dept. of Industrial and Systems Engineering.
A SUBGRADIENT ALGORITHM FOR CERTAIN MINIMAX AND MINISUM PROBLEMS
Jacques Chatelon, Donald Hearne, and Timothy J. Lowe Jan. 1977 36 p refs
(Grants DAHC04-75-G-0150; NSF ENG-74-22159; NSF ENG-75-10225)
(AD-A050166; RR-77-1; ARO-12640.22-m) Avail: NTIS HC A03/MF A01 CSCL 12/1

A subgradient algorithm is presented for the problem Min(F(x); x an element of R to the nth power) where F(x) = Max (f sub i(x); i = 1,2,..., m) and where f sub i(x) = sum over j of f sub ij(x). Each f sub ij is assumed to be a proper convex function, and the number of different subgradient sets associated with nondifferentiable points of f sub ij is assumed to be finite on any bounded set. Problems belonging to this class include those where the f sub ij are 1 sub p-norms (1 less than or equal to p less than or equal to infinity); for example, the linear approximation problem and both the minimax and minimum problems of location theory. Convergence of the algorithm to an optimal solution is proved and its effectiveness demonstrated by solving a number of problems from location theory and linear approximation theory. Computation results are compared with other solution methods.
Author

N78-20819# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Computer Science and Applied Mathematics.
INTERACTIVE ANALYSIS AND DISPLAY OF TABULAR DATA
William H. Benson and Bernard Kitous Jul. 1977 17 p refs Presented at 4th Ann. Conf. on Computer Graphic and Interactive Techniques, San Jose, Calif., 20-22 Jul. 1977
(Contract W-7405-eng-48)
(LBL-5598; Conf-770745-1) Avail: NTIS HC A02/MF A01

A program for simple data analysis and report design is described. The design emphasizes flexibility, ease of use, and rapid interactive response. These considerations are discussed in relation to the choices that may be made in the analysis and display design process. The analysis may be directed and monitored at several points, data selection and calibration, binning, choice of data scaling, choice of graphic variable, and scaling of the graphic variable. Table rows and columns can be reorganized by operators such as ranking, sequencing, and grouping, and recomputed from arithmetic combinations of existing rows and

columns. Where the raw data represent different cases scored over the same attributes, profile tables can be computed in a systematic fashion. Interactive report design is supported by a variety of page layout and chart annotation directives, which can be used to embellish and adjust the default line, bar, and pie charts. ERA

N78-20820# California Univ., Los Angeles. Dept. of Computer Science.
VERIFICATION OF MICROPROGRAMS Ph.D. Thesis
D. Paterson Jan. 1977 308 p refs
(Contract EY-76-S-03-0034)
(UCLA-34P214-45; UCLA-ENG-7707) Avail: NTIS HC A14/MF A01

High-level language programming, and formal program verification can be combined to produce correct, efficient microprograms. A structured, high-level microprograming language, STRUM, was designed. An optimizing compiler was created that produced microprograms for a horizontally microprogramable computer, the Burroughs D-Machine. A verification condition generator and algebraic simplifier were created to aid the formal verification of microprograms. A Hewlett-Packard HP-2115 was emulated using structured programing and high-level microprograming. This 1700 line microprogram was formally verified and exhaustively tested by using HP-2115 hardware diagnostic routines. ERA

62 COMPUTER SYSTEMS

Includes computer networks.

N78-20821 Purdue Univ., Lafayette, Ind.
THE ADAPTIVE ROUTING PROBLEM FOR LARGE STORE-AND-FORWARD COMPUTER-COMMUNICATION NETWORKS Ph.D. Thesis
Catherine E. Housts 1977 175 p
Avail: Univ. Microfilms Order No. 77-30087

An adaptive routing algorithm was developed dealing with message routing when the full length message was transmitted in its entirety. A thresholding technique was used to work with variations in message length. The algorithm's performance was evaluated by comparison with the performance of the exact mathematical deterministic routing problem. In order to apply the routing strategy to large networks, a partitioning approach was used. A partitioning algorithm was developed for communications network topologies. This algorithm used a generalized labelling technique to find the appropriate partitions of the original network. The adaptive routing algorithm was modified in order to take into account large network considerations. Dissert. Abstr.

N78-20822 Hawaii Univ., Honolulu.
A COMPUTER MODEL FOR AXIOMATIC SYSTEMS Ph.D. Thesis
Rosalind Louise Ibrahim 1977 182 p
Avail: Univ. Microfilms Order No. 7801048

A formal mathematics-like language is defined which enables a mathematician to write informal mathematical statements and proofs. The language is an LALR(1) language parsed by a simulated push-down transducer. A proof step is represented as a mathematical statement and a (possibly null) list of reasons which are references to other proof steps or to axioms or previous theorems. Proof steps are translated to predicate calculus and then to clause form as the conjunction of the reasons and the negation of the statement. A resolution-based theorem prover, working in first-order logic without equality, seeks to verify each step. Dissert. Abstr.

N78-20823 Georgia Inst. of Tech., Atlanta.
COMPUTATIONAL PROPERTIES OF REGULAR PROCESSOR NETWORKS Ph.D. Thesis
Renato Ermann 1977 123 p
Avail: Univ. Microfilms Order No. 7800054

Several design problems of large scale parallel processing systems become considerably easier to resolve if their interconnection patterns are regular. By means of a mathematical device, called a regular processor network (RPN), the structural properties of such systems were investigated. Techniques for characterizing the state transition graph of a RPN were developed. Several tradeoffs between hardware complexity and computing time in relation to the execution of the class of problems solvable within polynomial time by nondeterministic Turing machines were investigated. Structural conditions for the existence in a network of decentralized information routing schemes that do not require knowledge of processor sites were derived. Dissert. Abstr.

N78-20824 Kansas State Univ., Manhattan.
THE DISTRIBUTION OF CERTAIN OPERATING SYSTEM FUNCTIONS TO MICROPROCESSORS Ph.D. Thesis
Daniel Joseph Codespoti 1977 146 p
Avail: Univ. Microfilms Order No. 7802406

The aspects of attaching microprocessors to a computer system for the purpose of offloading certain operating system functions are presented. The functions to be offloaded are task scheduling, input/output scheduling, memory allocation scheduling, and several supervisor call functions. This concept is presented in two configurations: (1) the direct attachment of the microprocessors to a main bus of the CPU; and (2) the attachment of the microprocessors to a channel of the computer. The direct attached configuration is simulated by means of a model of the Interdata 8/32 Minicomputer System executing the OS/32-MT Operating System. Dissert. Abstr.

N78-20825 Pittsburgh Univ., Pa.
DESIGN OF FAULT-TOLERANT SEQUENTIAL NETWORKS Ph.D. Thesis
Laurence Li-li Wang 1977 95 p
Avail: Univ. Microfilms Order No. 7801898

The results of an investigation into the theory and design of fault-tolerant sequential networks with the new requirements and the new electronic technologies are reported. In particular, two classes of fault-tolerant sequential networks: fail-safe sequential networks and self-checking sequential networks, are studied. Design methods using Read-Only Memories (ROM) are investigated. The main results include a model which uses small amounts of external logic and a design method which can drastically reduce the ROM size. Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N78-20826 Syracuse Univ., N. Y.
AFFINE-INVARIANT MOMENT METHOD OF THREE DIMENSIONAL OBJECT IDENTIFICATION Ph.D. Thesis
Kuo-Pin Walter Wang 1977 202 p
Avail: Univ. Microfilms Order No. 7730774

The application of affine-invariant moment method to the three-dimensional aircraft identification problem and the human face identification problem is studied. In the aircraft identification problem, the affine invariant moments are used to reduce the number of samples used, while in the human face identification problem, they are used to show that the precise direction for picture taking is not necessary. The primary results show the theoretical and practical usefulness of this method.
Dissert. Abstr.

N78-20827*# Honeywell, Inc., Minneapolis, Minn.
INSENSITIVE CONTROL TECHNOLOGY DEVELOPMENT Final Report, Jul. 1976 - Nov. 1977
C. A. Harvey and R. E. Pope Feb. 1978 143 p refs
(Contract NAS1-14476)
(NASA-CR-2947; HONEYWELL-77-SRC/58) Avail: NTIS HC A07/MF A01 CSCL 12B

THe investigation of two insensitive controller synthesis techniques was reported. The finite dimensional inverse approach produces a time varying insensitive controller and/or parameter identifier by constructing inverse functions derived from a finite number of input output pair relationships. The MD/IM concept relies on the information matrix theory that was developed in the estimation and identification field. The MD/IM synthesis

technique is based on the hypothesis that minimizing the information matrix will reduce system identifiability and consequently system sensitivity to uncertain parameters. The controllers designed with both techniques were evaluated on a realistic C-5A aircraft flight control problem. Results indicate that the FDI controller is more suited to trajectory type problems because of its time varying nature. The MD/IM controller performed as well as the top-rated controllers of the initial effort and has direct application to aircraft flight control problems. Author

N78-20828# Stanford Univ., Calif.
A QUEUEING SYSTEM SUBJECT TO BREAKDOWN AND HAVING NON-STATIONARY POISSON ARRIVALS
Andrew W. Shogan 7 Nov. 1977 28 p refs
(Contract N00014-75-C-0561)
(AD-A049479; SU-TR-188) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper considers a single server queueing system that alternates stochastically between two states: operational and failed. When operational, the system functions as an M/Ek/1 queue. When the system is failed, no service takes place but customers continue to arrive according to a Poisson process; however, the arrival rate is different from that when the system is operational. Thus, both the arrival and service distributions are nonstationary. The durations of the operating and failed periods are exponential with mean 1/c-alpha and Erlang with mean 1/c-beta, respectively. Generating functions are used to derive the steady-state quantities L and W, both of which are decreasing and convex functions of c. The paper includes an analysis of several special and extreme cases and an application to a production-storage system. Author (GRA)

N78-20829# Logos Development Corp., Middletown, N. Y.
FEASIBILITY TEST OF LOGOSCAN SYSTEM Final Technical Report, May - Sep. 1977
Charles E. Byrne and John C. Byrne Griffiss AFB, N. Y. RADC Dec. 1977 33 p
(Contract F30602-77-C-0102)
(AD-A049715; RADC-TR-77-378) Avail: NTIS HC A03/MF A01 CSCL 09/2

The report documents results of a two-month test of LOGOSCAN System to establish its applicability as an OCR device in the Russian text input processing. All design objectives of the System have been met in its prototype version. Most of the OCR problems encountered during the test are directly traceable to hardware limitations. Problems of this nature can be easily eliminated by transferring the LOGOSCAN recognition logic to a new hardware environment within the current state-of-the-art. Author (GRA)

N78-20830# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.
PRACTICAL METHODS FOR THE COMPENSATION AND CONTROL OF MULTIVARIABLE SYSTEMS Semiannual Progress Report, 1 May - 31 Oct. 1977
Peter L. Falb and William A. Wolovich Nov. 1977 19 p refs
(Grant AF-AFOSR-3182-77)
(AD-A050364; AFOSR-78-0168TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

New techniques are developed for achieving a maximum number of zero entries in the closed loop transfer matrices of left invertible, linear multivariable systems through the employment of linear state variable feedback in conjunction with input dynamic compensation. Necessary and sufficient conditions are also presented for obtaining desired noninteractive structures for this class of systems. The question of simultaneous stabilization of the decoupled structures is also fully resolved. The procedures employed provide new insight regarding some related disturbance rejection questions. Numerous examples are presented in order to illustrate and clarify the presentation. Author (GRA)

N78-20831# Stanford Univ., Calif. Information Systems Lab.
FIXING THE STATE-FEEDBACK GAIN BY CHOICE OF CLOSED-LOOP EIGENSYSTEM Interim Report
G. Verghese and T. Kailath 1977 6 p refs
(Contracts F44620-74-C-0068; N00014-75-C-0601)
(AD-A050341; AFOSR-78-0142TR) Avail: NTIS MF A01 CSCL 12/1

The purpose of this short paper is to round out recent results in the literature on fixing the state-feedback gain by choice of closed-loop eigensystem. The constraints on attainable eigensystems and a formula for the feedback gain are derived in a direct manner, and interpreted using the idea of eigen-inputs. The well-known formula for the feedback gain of an optimal quadratic regulator is re-examined in this light; using a polynomial-matrix fraction, a matrix generalization of the scalar root-square characteristic equation is also obtained. Author (GRA)

N78-20832# Southeastern Massachusetts Univ., North Dartmouth. Dept. of Electrical Engineering.
A NEW LOOK AT THE STATISTICAL PATTERN RECOGNITION
C. H. Chen 10 Aug. 1977 17 p refs
(Grant AF-AFOSR-2951-76)
(AD-A050304; EE-76-4; AFOSR-78-0145TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the last two decades, statistical pattern recognition was well developed in theory and applications with the peak activity in the late sixties. The paper outlines important but unsolved problem areas in statistical pattern recognition and then takes a new and close look at some problems which are related to the finite sample size constraint. In an effort to bridge the gap between theory and practice, constructive solutions are provided for the problems; finite sample distance and information measures, finite sample nearest neighbor decision rule, contextual analysis, decision rules based on discrete and continuous measurements, and finite sample stochastic syntax analysis. It is concluded that there are still many challenging problems to be solved in statistical pattern recognition and every effort should be made such that the theory works well in practice. GRA

N78-20833# Logicon, Inc., San Diego, Calif.
USE OF COMPUTER SPEECH UNDERSTANDING IN TRAINING: A PRELIMINARY INVESTIGATION OF A LIMITED CONTINUOUS SPEECH RECOGNITION CAPABILITY Final Report, Mar. - Jun. 1977
J. E. Porter, M. W. Grady, M. B. Hicklin, and L. F. Lowe Jun. 1977 138 p
(Contract N61339-74-C-0048)
(AD-A049680; NAVTRAEQUIPC-74-C-0048-2) Avail: NTIS HC A07/MF A01 CSCL 05/8

This report describes the requirements for connected word speech recognition in training systems design. A review of the published literature and commercially available systems demonstrates that no existing capability exists which fully satisfies the unique features of speech recognition in training devices. A new approach toward limited continuous speech recognition was investigated based on examining the speech data itself to find characteristic sound structures; the order in which these sounds occur; and the time duration of, and between, these characteristic sounds. Algorithms were developed and exercised over speech data generated by a commercial preprocessor for a large number of utterances spoken by a single speaker. Characteristic structure was found for the 10 digits and the word point. Borrowing from the mathematical theory of formal languages, these sounds are termed transition letter sets. The residual data were formed into loop letter sets which are used to reduce false recognitions. Nondeterministic finite transducers, defined by the transition and loop letter sets for each vocabulary item, were exercised over entire utterances to validate the basic concepts and extract time duration data. GRA

N78-20834# Maryland Univ., College Park. Computer Science Center.
CELLULAR PYRAMIDS FOR IMAGE ANALYSIS Interim Report
Charles R. Dyer Nov. 1977 40 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A050137; TR-596; AFOSR-78-0126TR) Avail: NTIS HC A03/MF A01 CSCL 06/4

In an earlier report, a new class of multilayer bounded cellular automata was defined and shown to improve the lower bound recognition time for many basic array recognition tasks. The investigation of pyramid cellular acceptors is continued by presenting new results on their capabilities as two-dimensional pattern-recognizing machines. GRA

N78-20835# Naval Postgraduate School, Monterey, Calif.
A CYCLIC QUEUEING NETWORK WITH DEPENDENT EXPONENTIAL SERVICE TIMES
P. A. Jacobs (Stanford Univ., Calif.) Jul. 1977 36 p refs
(Grant NSF ENG-75-02026)
(AD-A050219) Avail: NTIS HC A03/MF A01 CSCL 12/1

A cyclic queueing network with two servers and a finite number of customers is studied. The service times for server 1 form an EARMA(1,1) process (exponential mixed autoregressive moving average process both of order 1) which is a sequence of positively correlated exponential random variables; the process in general is not Markovian. The service times for the other server are independent with a common exponential distribution. Limiting results for the number of customers in queue and the virtual waiting time at server 1 are obtained. Comparisons are made with the case of independent exponential service times for server 1. Author (GRA)

N78-20836# Naval Postgraduate School, Monterey, Calif.
MODELS FOR WORK BACKLOGS AT COMPUTERS THAT TIME-SHARE HETEROGENEOUS USERS
D. P. Gaver and J. P. Lehoczky Jul. 1977 39 p refs
(AD-A050014; NPS55-77-33) Avail: NTIS HC A03/MF A01 CSCL 12/1

A number of repairman-type models useful for describing and evaluating time-sharing computer systems with multitype users are presented and analyzed. Several approximation methods are introduced including one which allows for performance evaluation as a function of the queue discipline. Diffusion approximations are also considered, the accuracy of each of the approximation methods is assessed by numerical methods. The models proposed should prove to be useful for planning and evaluating both new and existing time-sharing computer systems. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N78-20837 California Univ., Berkeley.
ON THE DIFFERENTIAL GEOMETRY OF QUASI-SYMMETRIC DOMAINS Ph.D. Thesis
Rune Zelow Lindquist 1977 75 p
Avail: Univ. Microfilms Order No. 77-31450

The basic differential geometric properties of the quasi-symmetric domains, such as Bergman metric, Bergman connection, curvature tensor, holomorphic (bi-) sectional curvature, and certain submersion properties over cones were derived. A differential geometric proof of Satake's symmetry condition, given that the space is quasi-symmetric was also derived. A general formula for the covariant derivative of the curvature, on a reductive homogeneous space was developed. Dissert. Abstr.

N78-20838 Stevens Inst. of Tech., Hoboken, N. J.
SOME APPLICATIONS OF DIRECT INTEGRAL DECOMPOSITIONS OF W-* ALGEBRAS Ph.D. Thesis
Edward Sarian 1977 68 p
Avail: Univ. Microfilms Order No. 7726949

It is shown that the Pukanszky type 3 factor, when tensored with a type 2 sub i factor, produces another type 3 factor which does not possess the property of asymptotic Abelianness. Using this, four mutually non-isomorphic, non-asymptotically Abelian factors of type 3 are exhibited. In the global setting, it is shown that type 1 W algebras do not have property L and that non-commutative type 1 W algebras are not asymptotically Abelian. It is also proved that type 2 W algebras are not asymptotically Abelian, and that type 2 sub i W algebras which are asymptotically Abelian must necessarily have property L. Finally, the work of J.B. Conway on factors is extended to global W algebras. Specifically, if A is a W algebra of infinite type and A is a member of A, then A is a member of K if and only if C(A) = 0. Dissert. Abstr.

N78-20839 Oklahoma State Univ., Stillwater.
AXIOM SETS FOR RELATIVE HOMOLOGICAL ALGEBRAS Ph.D. Thesis
Daniel Joseph Fitzgerald 1977 160 p
Avail: Univ. Microfilms Order No. 78-01245

Three different sets of axioms for relative homological algebras in an Abelian category are presented. Introductory chapters on general categorical algebra and Abelian categories precede the discussion of relative homological algebra. The relationship between sets of axioms is determined and relationships among axioms of a given set are examined. The relative homological properties of the balanced extensions in the category of Abelian p-groups are derived. Dissert. Abstr.

N78-20840 Yale Univ., New Haven, Conn.
ON CENTRAL SIMPLE ALGEBRAS OF GIVEN EXPONENT Ph.D. Thesis
Darrell Eugene Haile 1977 56 p
Avail: Univ. Microfilms Order No. 77-28033

If A is a central simple algebra of exponent N, then there is an F-linear, nonsingular map which introduces an F-algebra imbedding from A into the sub algebra of a sup n-1, consisting of those elements fixed under the natural action of sigma sub n-1 on A sup n-1, where the former is the symmetric group on n-1 letters. The map can be chosen with the property that the subgroup of the group of F-linear automorphisms of A sup n-1 generated by the map and sigma sub n-1 is isomorphic to sigma sub n where tau corresponds to the cyclic permutation (1,2,...,n). This conjecture is shown to be a consequence of another conjecture, and proofs are given for the second conjecture for A a division algebra, n = 3 or 4, with char F does not equal 2 or 3. Dissert. Abstr.

N78-20841 Cincinnati Univ., Ohio.
TOPICS IN THE APPROXIMATION OF GENERALIZED INVERSES Ph.D. Thesis
Barton Joseph Jacobs 1977 68 p
Avail: Univ. Microfilms Order No. 77-29712

The convergence theorem of C. W. Groetsch is extended and applied. A uniform error estimate is derived for a general class of approximations to the generalized inverse of an operator with closed range. Two new applications of the approximation theorem are introduced. The generalized inverse theory for bounded operators with non-closed range is reviewed. With some modification the convergence theorem of Groetsch is extended to such operators, using techniques of Riesz-Sz.Nagy. The Euler method is applied to this extension, along with a result of elementary calculus. The application of Lagrange and Hermite interpolation to the approximation theorems is discussed. For operators with closed range, uniform error estimates are given. A generalization of the method of Kammerer and Nashed is used to establish asymptotic error estimates for both interpolation methods for operating with non-closed range. Dissert. Abstr.

N78-20842 Purdue Univ., Lafayette, Ind.
AN ENTIRE FUNCTION WHICH INTERPOLATES A FAMILY OF FUNCTIONS WITH ORDERS RANGING BETWEEN ONE AND INFINITY Ph.D. Thesis
Larry Jay Kotman 1977 223 p
Avail: Univ. Microfilms Order No. 77-30095

W. K. Hayman in Research Problems in Function Theory poses the question of existence of meromorphic functions of finite order with at least two deficient values and growth satisfying a specific function. A. A. Goldberg in The Possible Magnitude of the Lower Order of an Entire Function with a Finite Deficient Value poses the question of existence of entire functions of infinite order, finite lower order, and having a finite deficient value. An affirmative answer is given to both questions. Existence is proven by constructing an explicit infinite product representation of an entire function with zero having positive deficiency and meeting the requirements. A polynomial substitute is exhibited for the exponential convergence factor which appears in the standard Weierstrass primary factor. Then the complex plane is partitioned into annular regions which are appropriate for interpolating through a family of entire functions. Finally a comparison function by D. Drasin is taken and generalized to obtain a counting function for zeros which are used to construct an entire function. Dissert. Abstr.

N78-20843 California Univ., Santa Barbara.
ONE-SIDED IDEALS IN A C*-ALGEBRA Ph.D. Thesis
Jen-chung Chuan 1977 106 p
Avail: Univ. Microfilms Order No. 77-27909

The investigation of L as a family of Banach algebras is carried out mainly using techniques of non-commutative C* - algebras. The factorization property and existence of right approximate identities of members of L are given. Characterizations of closed left ideals are given. Generalizations of the factorization property and their consequences are discussed. Equivalent conditions for closed one-sided ideals to be two-sided are also studied. A set of axioms is introduced to give an internal abstract characterization of Banach algebras that are embeddable as closed left ideals of some C* - algebra. A brief summary is given of known results concerning bijective correspondences between the family of all closed left ideals of a fixed C* - algebra and other families of sets. The question of uniqueness of the C* -subalgebra generated by a closed left ideal is discussed. It is shown that under a slight perturbation the property of being a minimal left ideal remains unchanged. Dissert. Abstr.

N78-20844 Purdue Univ., Lafayette, Ind.
THE FUNDAMENTAL DIVISOR OF NORMAL DOUBLE POINTS OF SURFACES Ph.D. Thesis
David Joseph Dixon 1977 28 p
Avail: Univ. Microfilms Order No. 77-30069

Let W be a surface with a normal singular point w. Consider the minimal resolution of that singularity, pi: W prime yields W. Let pi/1(w) = y = y sub 1...y sub d, where the y sub i are distinct irreducible curves on W prime. We are interested in two divisors on W prime both of which have support on Y. These divisors are Z, the fundamental divisor, and M, the divisor of the maximal ideal. In general Z is less than or equal to M. If w is a double point singularity which satisfies certain conditions, then Z = M. Dissert. Abstr.

N78-20845 Northwestern Univ., Evanston, Ill.
THE ZERO ENERGY THREE BODY PROBLEM Ph.D. Thesis
Neal David Hulkower 1977 75 p
Avail: Univ. Microfilms Order No. 78-00715

Solutions to the three body problem of celestial mechanics in which all particles separate from their center of mass like t to the 2/3 power were studied. By Chazy's classification of motion, this can only occur for the three body problem when the total energy of the system is zero. For the planar problem, it was shown that these solutions asymptotically approach the vertices of nonrotating central configurations as t approaches infinity. In addition, the structure and dimension of the sets of initial condition leading to such motion were obtained. A refined classification of motion for the zero energy planar three body problem is presented. Dissert. Abstr.

N78-20846 Northwestern Univ., Evanston, Ill.
ON SPECIAL CLASSES OF ENTIRE FUNCTIONS WHOSE GROWTH AND ZEROS ARE RESTRICTED Ph.D. Thesis
Carl Lindell Prather 1977 159 p
Avail: Univ. Microfilms Order No. 7800745

The first part of this dissertation is concerned with balanced trigonometric polynomials whose zeroes are to be real, or more generally to lie in a horizontal strip. The second part is an investigation of the uniform limits on bounded sets of entire functions of genus less than or equal to 2p whose zeroes are real, lie on certain rays, or lie in a certain number of sectors of a specific size. Also investigated are particular inequalities between certain sets of consecutive coefficients of a power series. Dissert. Abstr.

N78-20847 Delaware Univ., Newark.
MOVING BOUNDARY PROBLEMS FOR A CLASS OF SINGULAR PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis
Vasilios Alexiades 1978 153 p
Avail: Univ. Microfilms Order No. 78-00121

Classical as well as generalized solutions were studied along with corresponding regularity questions. The approach to classical solutions was via potential theoretic methods, namely what could be called the Theory of Generalized Axially Symmetric Heat Potentials, by means of which the problems were solved by reduction to integral equations. The approach to generalized solutions is a variational approach in weighted Hilbert-Sobolev spaces that seem very natural for the problem. Dissert. Abstr.

N78-20848 Princeton Univ., N. J.
DIFFERENTIAL EQUATIONS ASSOCIATED WITH ELLIPTIC SURFACES Ph.D. Thesis
Peter Frederick Stiller 1977 140 p
Avail: Univ. Microfilms Order No. 7800274

The link between the monodromy representation or homological invariant of an elliptic surface, the associated Gauss-Manin connection given as a second order algebraic differential equation, and the geometry and arithmetic of the surface itself is examined. A class of differential equations is defined which can determine when two elliptic surfaces are the same flat vector bundle and/or complex homology representation. Information is also obtained on the existence of division points on the generic fibre rational over the function field of the base curve. An algorithm for computing the monodromy is presented and applied to compute a number of examples. A formula is given for Manin's map from the group of points on the generic fibre rational over the function field of the base curve into that field. Dissert. Abstr.

N78-20849 Notre Dame Univ., Ind.
THE 3-STRUCTURE OF FINITE CHEVALLEY GROUPS Ph.D. Thesis
Hassan Azad 1978 110 p
Avail: Univ. Microfilms Order No. 78-00559

A finite simple group is of even order, and if one chooses a suitable involution in a known simple group, then the structure of its centralizer is enough to determine the group. In particular, all Chevalley groups, defined over fields of odd characteristic, have been classified in this manner. However, classification of Chevalley groups of even characteristic has remained intractable. In view of this, it is of some interest to determine the 3-structure of finite Chevalley groups. The method in principle works for any prime. A detailed study of Weyl groups of the exceptional groups should throw some light on the general problem. Dissert. Abstr.

N78-20850 New Mexico Univ., Albuquerque.
FREQUENCY DOMAIN CONSIDERATIONS OF NUMERICAL INTEGRATION TECHNIQUES Ph.D. Thesis
Timothy Scott McDonald 1977 89 p
Avail: Univ. Microfilms Order No. 78-00636

Primitive numerical integration algorithms, such as trapezoidal integration and Simpson's rule, are viewed as digital filters. The main advantage of this point of view is that it reveals the frequency domain effects of these integration methods. In particular, the inadequacy of Classical primitive methods when applied to (input) time functions with significant frequency content above one-fourth of the sampling frequency is illustrated. Starting with the common linear, recursive, time-invariant algorithm requiring up to N past values of the input and output samples and the present input sample, where N is the order of the algorithm, a set of numerical integrators up to order N = 3 is developed. In addition to having the above type of computing formula, an integrator is in this set if and only if it meets the requirements of (1) correct dc response, (2) correct phase shift at all frequencies, and (3) stability. All of the more common Classical methods (except for rectangular integration) are included in this set. Dissert. Abstr.

N78-20851 Cornell Univ., Ithaca, N. Y.
OPTIMAL DESIGNS FOR THE ELIMINATION OF HETEROGENEITY Ph.D. Thesis
Ching-Shui Cheng 1977 88 p
Avail: Univ. Microfilms Order No. 7801614

The problem of finding an optimal design for the elimination of one-way heterogeneity when a balanced block design does not exist is studied. A general result on the optimality of certain asymmetrical designs is proved and applied to the block design settings. The multi-way heterogeneity problem is also studied. The C-matrix for the n-way heterogeneity setting when less than 2 is derived. It turns out to be a natural extension of the known formulas in the lower dimensional case. It is shown that under some regularity, the search for optimal designs can be reduced to that in a lower-way setting. Youden hyperrectangles and Youden

hypercubes are defined and shown to have some optimality properties. Kiefer's patchwork method and Ruiz-Seiden's geometric construction are used to construct Youden hyper-rectangles for many parameter values. Dissert. Abstr.

N78-20852# Weapons Research Establishment, Salisbury (Australia).
AN IMPROVED FINITE ELEMENT FORMULATION DERIVED FROM THE METHOD OF WEIGHTED RESIDUALS
A. J. Fletcher Jun. 1977 32 p refs
(AD-A048026; WRE-TM-1827(W)) Avail: NTIS HC A03/MF A01 CSCL 12/1

By replacing the residual with its least-squares fit an improvement has been made to the Method of Weighted Residuals. For finite element applications the least-squares fit is made on an element basis. The improved formulation is illustrated by a number of examples drawn mainly from fluid-flow problems. The new formulation is closely related to the use of reduced integration and detailed comparisons with both exact and reduced integration are presented. The present formulation produces superior results to the use of reduced integration for some problems and formulations particularly when used with quadratic triangular elements. Author (GRA)

N78-20853# Wisconsin Univ., Madison. Mathematics Research Center.
GENERALIZED EQUATIONS AND THEIR SOLUTIONS. PART 1: BASIC THEORY Summary Report
Stephen M. Robinson Nov. 1977 24 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-74-20584)
(AD-A049495; MRC-TSR-1812-Pt-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

A class of 'generalized equations,' involving point-to-set mappings, which formulate the problems of linear and nonlinear programming and of complementarity, among others, has been considered. Solution sets of such generalized equations are shown to be stable under certain hypotheses; in particular a general form of the implicit function theorem is proved for such problems. An application to linear generalized equations is given at the end of the paper; this covers linear and convex quadratic programming and the positive semidefinite linear complementarity problem. The general nonlinear programming problem is treated in Part II of the paper, using the methods developed here. GRA

N78-20854# Colorado State Univ., Fort Collins. Dept. of Mathematics.
UNIFORM APPROXIMATION WITH CONSTRAINTS Interim Report
B. L. Chalmers and G. D. Taylor 1977 85 p refs
(Grants AF-AFOSR-2878-76; NSF MCS-76-08518)
(AD-A050384; AFOSR-78-0170TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

A survey of uniform approximation with constraints is given. Both linear and nonlinear theories are discussed as well as general functional analytic approaches. The discussions of the various theories corresponding to different side conditions includes existence, characterization uniqueness, computational and rates of approximation results. The paper includes 168 references and is an exhaustive survey of this theory. Author (GRA)

N78-20855# University of Southern Calif., Los Angeles. Dept. of Electrical Engineering.
MULTISTAGE ESTIMATION OF DYNAMICAL AND COLORED NOISE STATES IN CONTINUOUS-TIME LINEAR SYSTEMS Interim Report
H. D. Washburn and J. M. Mendel 1977 26 p refs
(Grant AF-AFOSR-2797-75)
(AD-A050272; AFOSR-78-0144TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper extends Friedland's bias estimation technique to the problem of estimating dynamical states and colored noise states. An exact multistage decomposition is derived not only for the state estimation equations, but also for the associated error covariance equations. Additionally, a second-order suboptimal multistage estimator is derived using a perturbation technique. Whereas a high-order matrix Riccati equation must be solved when the exact results are used, a matrix Riccati equation, of the dimension of the colored noise states, must be solved when the suboptimal results are used. GRA

N78-20856# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.
APPROXIMATION OF NONLINEAR FUNCTIONAL DIFFERENTIAL EQUATION CONTROL SYSTEMS Interim Report
H. T. Banks Jun. 1977 40 p refs
(Grants AF-AFOSR-3092-76; NSF GP-28931)
(AD-A050251; AFOSR-78-0135TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A general approximation framework is developed for use in optimal control problems governed by nonlinear functional differential equations. The approach entails only the use of linear semigroup approximation results while the nonlinearities are treated as perturbations of a linear system. Numerical results are presented for several simple nonlinear optimal control problem examples. GRA

N78-20857# Princeton Univ., N. J. Dept. of Statistics.
LIMIT THEOREMS FOR THE SIMPLE BRANCHING PROCESS ALLOWING IMMIGRATION: A REVIEW AND NEW RESULTS. 1: THE CASE OF FINITE OFFSPRING MEAN
Anthony G. Pakes Oct. 1977 49 p refs
(Contract N00014-75-C-0453)
(AD-A049692; TR-128-Ser-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper reviews known limit theorems for population sizes of Bienayme-Galton-Watson process allowing immigration. For non-critical cases it is known the limit distribution is non-defective if a logarithmic moment of immigration distribution is finite. New results of this paper concern the situation where this moment is infinite and give limit theorems for a certain slowly varying function of the population size. A parallel discussion is given for the critical case and the continuous time process. Some results on rate of decay of transition probabilities and growth rate of stationary measure are given and used to obtain limit theorems for a reversed time process. Author (GRA)

N78-20858# Delaware Univ., Newark. Inst. for Mathematical Sciences.
ON A CLASS OF BOUNDARY VALUE PROBLEMS FOR A COMPOSITE SYSTEM OF FIRST ORDER DIFFERENTIAL EQUATIONS Interim Report
R. P. Gilbert and M. Schneider (Technische Univ., Berlin) 1977 26 p refs
(Grant AF-AFOSR-2879-76; AF Proj. 2304)
(AD-A050375; IMS-TR-21; AFOSR-78-0047TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A system of 2n-1 first order partial differential equations, 2n of which are elliptic is investigated. Representation theorems are obtained using earlier methods. A necessary condition is given for the existence of a unique continuous solution of an associated Riemann boundary value problem. Results of this type are of interest for the study of systems of mixed type which occur for example in transonic flows. GRA

N78-20859# Delaware Univ., Newark. Inst. for Mathematical Sciences.
ON RIEMANN BOUNDARY VALUE PROBLEMS FOR CERTAIN LINEAR ELLIPTIC SYSTEMS IN THE PLANE Interim Report
Heinrich Begehr and Robert P. Gilbert 1977 27 p refs
(Grant AF-AFOSR-2879-76; AF Proj. 2304)
(AD-A050376; IMS-TR-15; AFOSR-78-0048TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The partial differential equations which occur in the theory of elastic plates and shells are among those which may be reduced to a first order elliptic system. Under certain regularity conditions for the coefficients, a Beltrami transformation exists taking the general first-order, elliptic systems into a normal-Douglis-form. This form can be further simplified, and more concisely represented by utilizing the algebra of hypercomplex numbers. The theory of solutions to these linear systems is known as generalized hyperanalytic function theory. The present work deals with Riemann boundary value problems for linear systems.

It is shown that every solution of the homogeneous boundary value problem may be written as a linear combination of special solutions resembling Bers generating pairs. The nonhomogeneous solution is represented as a homogeneous solution plus a particular solution which is given as an integral representation using a generalized Cauchy kernel. GRA

N78-20860# Stanford Univ., Calif. Dept. of Electrical Engineering.
A UNIFICATION OF SYSTEM EQUIVALENCE DEFINITIONS Interim Report
B. Levy, S.-Y. Kung, M. Morf, and T. Kailath 1977 8 p refs
(Contract F44620-74-C-0068)
(AD-A050345; AFOSR-78-0185TR) Avail: NTIS MF A01 CSCL 12/1

The concept of system equivalence was introduced to generalize the notion of system similarity to nonstate-space models, i.e., to systems described by polynomial operators. The idea of equivalence is relatively natural: given two descriptions of the same physical system by two different observers, one would like to assert whether these descriptions are the same from a coordinate-free point of view. In this paper, system equivalence is studied from both the polynomial and the state-space points of view. Previous definitions of system equivalence are connected together, and an alternative definition is proposed. This new approach is based on constructing complete information sets for a given differential system by expanding its usual input/output map. This idea generalizes the earlier concept of maximal-strict system equivalence. GRA

N78-20861# Aberdeen Univ. (Scotland).
ENUMERATION OF LARGE COMBINATORIAL STRUCTURES Final Technical Report, Dec. 1974 - Nov. 1977
Nov. 1977 54 p refs
(Grant DA-ERO-75-G-014)
(AD-A050291) Avail: NTIS HC A04/MF A01 CSCL 12/1

New results are given about the number of 2-connected labelled (n,q) graphs, i.e. graphs on n points and q lines, including a combinatorial interpretation of Temperley's differential equation satisfied by the exponential generating function of this number (applicable in Statistical Mechanics). This leads to two methods for finding asymptotic approximations to this number. A curious paradox is found in the asymptotic enumeration of unlabelled graphs. Work was continued on connected, sparsely-edged graphs of various kinds, again including asymptotic results with possible applications. Finally a new ghost expansion method is described to obtain asymptotic results from the Exclusion-Inclusion Theorem by applying the method to a particular graphical example. The appendices consist of four research papers which have been submitted for publication to different mathematical journals.GRA

N78-20862# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE DISTANCE BETWEEN A POINT AND AN ELLIPSOID Final Report
V. Kucher Oct. 1977 23 p refs
(DA Proj. 1W1-61102-AH-43)
(AD-A050310; BRL-2024) Avail: NTIS HC A02/MF A01 CSCL 12/1

The method of the calculus of variations is used to determine the distance from any point, not in a coordinate plane, to the surface of an ellipsoid. The distance from any point in the coordinate plane to the surface of an ellipsoid is formulated by the method of Lagrange multipliers. A computer program has been developed to compute this distance. Author (GRA)

N78-20863# Stanford Univ., Calif. Dept. of Electrical Engineering.
A MODIFIED DISPLACEMENT RANK AND SOME APPLICATIONS Interim Report
B. Friedlander, T. Kailath, and M. Morf Dec. 1977 6 p refs Presented at the 1977 IEEE Conf. on Decision and Control, New Orleans, Dec. 1977 Submitted for publication
(Contracts F44620-74-C-0068; N00014-75-C-0601; AF Proj. 2304)
(AD-A050303; AFOSR-78-0143TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Recursive Algorithms for linear least squares estimation problems have been based mainly on state-space models. Recently, some new recursive solutions were obtained for processes classified in terms of their index of nonstationarity or equivalently--the displacement rank of their covariance functions. While this definition provides a natural explanation of the properties of constant-coefficient state-space models, it is not satisfactory for time-variant models. However, a modified definition of the displacement rank makes it possible to imbed time-varying state-space models in the more general input-output framework. In so doing, one is able to show the mutual relationships of the Kalman filter Riccati equation, the time-varying Chandrasekhar equations and the Krein-Levinson equations. GRA

N78-20864# Stanford Univ., Calif. Dept. of Engineering-Economic Systems.
PREFERENCE MODELING OF UTILITY SURFACES
Khaled H. Nahas Dec. 1977 185 p refs Prepared in cooperation with Decisions and Designs, Inc., McLean Va.
(Contract N00014-76-C-0074; Grant NSF ENG-76-81056)
(AD-A050134; SU-EES-DA-77-4) Avail: NTIS HC A09/MF A01 CSCL 12/1

This research proposes a new framework for constructing preference functions when the consequences of a decision are judged by multiple attributes or criteria. Methods for assessing single-attribute preference functions have been well established. In this work, no symmetry assumption is necessary, as each multiattribute preference function is tailor-fit to only those regularities that exist in a particular problem setting. Those parts of the preference function that are subject to simplifying assumptions are decomposed using a new classification scheme to derive further independence assumptions for the standard models. Those parts of the preference function that are indecomposable are handled using a new discretization scheme along with a behaviorally motivated interpolation rule to fill the gaps. The flexibility of these methods allows an analyst to make trade-offs between the degree of accuracy desired and amount of effort needed. GRA

N78-20865# Wisconsin Univ., Madison. Mathematics Research Center.
SYMMETRIZED SEPARABLE CONVEX PROGRAMMING Technical Summary Report
L. McLinden Sep. 1977 74 p refs
(Contract DAAG29-75-C-0024; Grant NSF MPS-75-08025)
(AD-A049398; MRC-TSR-1791) Avail: NTIS HC A04/MF A01 CSCL 12/1

The duality model for convex programming is analyzed from the viewpoint of perturbational duality theory. Relationships with the traditional Lagrangian model for ordinary programming are explored in detail, with particular emphasis placed on the respective dual problems, Kuhn-Tucker vectors, and extremality conditions. The case of homogeneous constraints is discussed by way of illustration. The Slater existence criterion for optimal Lagrange multipliers in ordinary programming is sharpened for the case in which some of the functions are polyhedral. The analysis generally covers nonclosed functions on general spaces and includes refinements to exploit polyhedrality in the finite-dimensional case. Underlying the whole development are basic technical facts which are developed concerning the Fenchel conjugate and preconjugate of the indicator function of an epigraph set. GRA

N78-20866# Wisconsin Univ., Madison. Mathematics Research Center.
NON-LINEAR STURM-LIOUVILLE PROBLEMS WITH NO SECONDARY BIFURCATION
J. B. McLeod and C. A. Stuart Sep. 1977 18 p refs
(Contract DAAG29-75-C-0024)
(AD-A049399; MRC-TSR-1792) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper is concerned with giving sufficient conditions that in the nonlinear boundary value problem: u sub '(x) + [q(x) + G (x, u(x), lambda]u (x) = 0 with u(0) = 0, u(1) = 0 or u'(1) = 0, there should be no secondary bifurcation. Given a branch of solutions bifurcating from the trivial solution, there should be no further bifurcation on that branch. Sufficient conditions of G were given which include Kolodner's problem of the motion of a heavy rotating string. Author (GRA)

N78-20867# Wisconsin Univ., Madison. Mathematics Research Center.

BEST MEAN APPROXIMATION BY SPLINES SATISFYING GENERALIZED CONVEXITY CONSTRAINTS

Dennis D. Pence Oct. 1977 21 p refs
(Contracts DAAG29-75-C-0024; NSF MCS-75-17385)
(AD-A049421; MRC-TSR-1794) Avail: NTIS
HC A02/MF A01 CSCL 12/1

A characterization of the best L sub 1-approximation to a continuous function by classes of fixed knot polynomial splines which satisfy generalized convexity constraints is presented and uniqueness is shown. Included is the possibility of specifying the positivity, monotonicity, or convexity of the class. The proof of uniqueness uses recently developed results for Hermite-Birkhoff interpolation by splines. Author (GRA)

N78-20868# Wisconsin Univ., Madison. Mathematics Research Center.

HARMONIC FUNCTIONS ON REGIONS WITH REENTRANT CORNERS, PART 1

Rosser J. Barkley Oct. 1977 14 p refs
(Contract DAAG29-75-C-0024)
(AD-A049423; MRC-TSR-1796-Pt-1) Avail: NTIS
HC A02/MF A01 CSCL 12/1

It has been known for quite a while that if a function u(x, y) is harmonic in a region with reentrant corners, there are almost certainly infinite discontinuities of the first derivative of u in the neighborhood of the reentrant corner (or corners). Simple examples are for an L-shaped region or T-shaped region. Some instances of these have been treated by conformally mapping the region into the interior of a rectangle. Attempts to solve the problem as first posed by a finite difference scheme or a finite element scheme will usually give poor approximations near any reentrant corner because the finite differences or finite elements have large truncation errors when a first derivative is infinite. When conformal mapping is tried, the conformal maps are usually only approximate, and similar errors arise, for more or less similar reasons. In view of recent work giving convergent expansions for u in the neighborhood of reentrant corners one can now give accurate solutions for such problems. Some experiments with such regions are reported. GRA

N78-20869# Wisconsin Univ., Madison. Mathematics Research Center.

ROBUSTNESS AND EFFICIENCY PROBLEMS OF SOME RANDOMIZATION PROCEDURES IN EXPERIMENTAL DESIGNS

Chien-Fu Wu Oct. 1977 32 p refs
(Contract DAAG29-75-C-0024)
(AD-A049424; MRC-TSR-1797) Avail: NTIS
HC A03/MF A01 CSCL 12/1

A concept of model-robustness is defined in terms of the performance of the design in the presence of model violations. The robustness problem is discussed for several randomization procedures commonly used in experimental design situations. Among them the completely randomized design, the randomized block design and the randomized Latin square design are shown to be model-robust in their own settings. To compare different randomization procedures, a concept of efficiency is also defined. This concept, when applied to different designs, gives results which are consistent with the intuitive grounds on which the designs are suggested. Author (GRA)

N78-20870# Wisconsin Univ., Madison. Mathematics Research Center.

A VARIABLE METRIC METHOD FOR LINEARLY CONSTRAINED MINIMIZATION PROBLEMS

Klaus Ritter Oct. 1977 22 p refs
(Contract DAAG29-75-C-0024)
(AD-A049425; MRC-TSR-1798) Avail: NTIS
HC A02/MF A01 CSCL 12/1

An algorithm is described for minimizing a nonlinear function subject to linear inequality constraints. GRA

N78-20871# Wisconsin Univ., Madison. Mathematics Research Center.

THE LEMMA OF MAX MUELLER-NAGUMO-WESTPHAL FOR STRONGLY COUPLED SYSTEMS OF PARABOLIC FUNCTIONAL-DIFFERENTIAL EQUATIONS

Karl L. Nickel Oct. 1977 22 p refs
(Contract DAAG29-75-C-0024)
(AD-A049427; MRC-TSR-1800) Avail: NTIS
HC A02/MF A01 CSCL 12/1

By Max Mueller a lemma has been given to find upper and lower bounds for the solutions of ordinary differential equations. By Nagumo and Westphal another lemma has been provided to do the same for parabolic differential equations. In the following paper these two lemmata are combined and extended to strongly coupled systems and to functional-differential equations. Author (GRA)

N78-20872# Wisconsin Univ., Madison. Mathematics Research Center.

SOME ALGEBRAIC RELATIONS COMMON TO A SET OF INTEGRABLE PARTIAL AND ORDINARY DIFFERENTIAL EQUATIONS

Mark Adler Oct. 1977 43 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-75-17385)
(AD-A049428; MRC-TSR-1801) Avail: NTIS
HC A03/MF A01 CSCL 12/1

In recent years, a variety of completely integrable Hamiltonian systems, both in ordinary and partial differential equations, have been subject to intensive scrutiny. Examples are the Toda and Kac-Moerbeke systems in ordinary differential equations, and their respective continuum limits, the Boussinesq and Korteweg-de Vries equations in partial differential equations. Of interest, for at least a formal understanding of the above mathematical phenomena, is the existence of relations common to all these phenomena, for instance, the so called Backlund transformations, or the associated Lax isospectral formulation of the above equations. This paper exhibits a common method for the construction of Lenard relations, which yield along with Gelfand-Dikii type operator trace formulas, an explicit recursive construction of the hierarchy of integrable systems associated with each of the above systems. In addition, an operator-valued function is constructed which yields the infinitesmal generators of the Lax type isospectral deformations associated with the above mentioned hierarchies of systems. GRA

N78-20873# Rice Univ., Houston, Tex. Dept. of Mechanical Engineering.

ON THE COMPARATIVE EVALUATION OF ALGORITHMS FOR MATHEMATICAL PROGRAMMING PROBLEMS

A. Miele and S. Gonzalez 1977 43 p refs
(Grant AF-AFOSR-3075-76)
(AD-A050383; AFOSR-78-0169TR) Avail: NTIS
HC A03/MF A01 CSCL 12/1

This paper considers the comparative evaluation of algorithms for mathematical programming problems. It is concerned with the measurement of computational speed and examines critically the concept of equivalent number of function evaluations N sub e. Both theoretical considerations and extensive numerical examples carried out in conjunction with the Fletcher-Reeves algorithm, the Davidson-Fletcher-Powell algorithm, and the quasilinearization algorithm suggest the following: the N sub e concept, while accurate in some cases, has drawbacks in other cases; indeed, it might lead to a distorted view of the relative importance of an algorithm with respect to another. The above distortion can be corrected through the introduction of a more general parameter N-bar sub e. This generalized parameter is constructed so as to reflect accurately the computational effort associated with function evaluations and algorithmic operations. GRA

N78-20874# Northwestern Univ., Evanston, Ill. Dept. of Computer Sciences.

SYNTHESIS OF APPROXIMATION ERRORS

E. H. Bareiss and P. Michel Jul. 1977 149 p refs
(Contract EY-76-S-02-2280)
(COO-2280-33) Avail: NTIS HC A07/MF A01

The synthesis uses a small class of dimensionless elementary error functions which are weighted by the coefficients of the expansion of the regular part of the function. The question was answered whether a computer can determine the analytical nature of a solution by numerical methods. It was shown that continuous least squares approximations of irregular functions can be replaced

by discrete least squares approximation and how to select the discrete points. The elementary error functions were used to show how the classical convergence criteria can be markedly improved. ERA

N78-20875# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.

A GENERAL TECHNIQUE FOR THE CONSTRUCTION OF ADAPTIVE LAWS FOR ARBITRARILY FAST ADAPTIVE OBSERVERS

Gerhard Kreisselmeier Jun. 1977 9 p refs

(DLR-IB-552-77/18) Avail: NTIS HC A02/MF A01

State and parameter observations of unknown linear systems by use of an observer with an additional adaptive loop (adaptive observer) are considered. Using a parameterized representation of the Luenberger observer, a general technique for the construction of suitable adaptive laws is presented and proven to result in global and arbitrarily fast convergence. The adaptive law performs a steepest descent on arbitrarily chosen convex, positive definite criteria of the output observation error time history of the so-called instantaneous Luenberger Observer candidate. Author (ESA)

N78-20876# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

STUDIES IN THE FREQUENCY DOMAIN DESIGN OF MULTIVARIABLE SYSTEMS

Ranajit Mitra Sep. 1977 39 p refs

(DLR-IB-552-77/24) Avail: NTIS HC A03/MF A01

The theoretical aspects of multivariable systems design were investigated following the Rosenbrock method of diagonal dominance. The multivariable stability was studied and a positive test derived. The application of diagonal dominance and Gershgorin bands for stability analysis are discussed. The overall design procedure is outlined and a practical application to vibration isolation for a helicopter is given. ESA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N78-20877 California Univ., Los Angeles.

AN INVESTIGATION OF THE DISTRIBUTION OF THE ACTUAL ERROR RATE IN DISCRIMINANT ANALYSIS Ph.D. Thesis

James W. Sayre 1977 193 p

Avail: Univ. Microfilms Order No. 7730957

Attention is focussed on the probabilities of misclassification associated with a rule based on the sample linear discriminant function. Some asymptotic results for the distribution of the actual error rates, under various assumptions about the parameters, were discussed but the approximations in some cases have not been very good. The basic objectives of this study are fourfold. The first being to determine the form, in the one variable case, of the exact distribution and density functions of the actual error rates. Next, to obtain formulae for the asymptotic distribution and asymptotic moments of the actual error rates. Also, to compare these above results with those obtained in a sampling experiment. And finally to describe an epidemiologic situation where these results may be applied. Dissert. Abstr.

N78-20878 California Univ., Berkeley.

OPTIMAL INSPECTION POLICIES FOR DETERIORATING MARKOV PROCESSES Ph.D. Thesis

Robert David Levin 1977 54 p

Avail: Univ. Microfilms Order No. 77-31436

A model is presented of a Markov process whose state is unknown except when an inspection is performed. The evolution of the process is governed by fixed transition probability matrices P and Q under non-inspection and inspection, respectively. The costs of inspection and non-inspection depend on the current state. The objective is to characterize inspection policies which minimize expected total discounted cost. The following specific models are presented. Model (1) is a process which starts in state O and is terminated when, on inspection, the state is found to exceed some fixed value M. In Model (2) the process is repaired (reverts to state O) when the state at inspection exceeds M. Model (3) is an inventory process with uncertain supply as well as demand. Given order size n, the number received is Binomial. Costs of ordering, storage, and shortage are incorporated. Dissert. Abstr.

N78-20879 Virginia Polytechnic Inst. and State Univ., Blacksburg.

TOPICS ON THE ESTIMATION OF SMALL PROBABILITIES Ph.D. Thesis

Wolfgang Pelz 1977 131 p

Avail: Univ. Microfilms Order No. 7801598

The Maximum Likelihood/Entropy (ML/E) method of estimation of the cell probabilities for multinomial and contingency table problems is derived and discussed. Methods for calculating the ML/E estimates for varying circumstances including multidimensional tables are presented. Comparisons with other estimation methods are made and recommendations for selection of the more appropriate method in particular situations are given. The Kolmogorov-Smirnov one-sample statistic is considered. A transformation of an approximation method is derived and some of its properties discussed. The main value of the new formulae is to obtain better convenient approximations in the lower tail than have been possible using other methods. The formulae are related to the theta functions. The relationships between various methods are given, as well as recommendations for each method of unstable range of the independent variable. An analysis is made of the errors obtained by use of the approximation. Dissert. Abstr.

N78-20880 George Washington Univ., Alexandria, Va.

ON THE QUADRATIC CLASSIFICATION PROBLEM FOR ZERO-MEAN STATIONARY NORMAL TIME SERIES Ph.D. Thesis

Gerald Edward Rubin 1977 127 p

Avail: Univ. Microfilms Order No. 7801099

Various alternative quadratic discriminants close to Z sub T (based on a spectral analysis approach) are considered for which some of the difficulties involved with Z sub T are alleviated. The main approximation is a spectral approximation (Z sub T) to Z sub T which is a finite linear combination of squared finite Fourier transforms. Some easily computed moment and cdf approximations for it are considered. All of the alternative discriminants to Z sub T are compared with Z sub T and with each other in various theoretical and practical ways. Specifically, normed forms of all of these discriminants are shown to be close to each other for large T by proving the asymptotic convergence to 0 of normed differences of these in the almost-sure and mean-square senses. Formulas are derived for the asymptotic normed means, variances and general cumulants for each of these discriminants, with each of these processes having the same asymptotic parameters. The classification tests resulting from using these discriminants are proven to be consistent. Also cumulant approximations are considered with emphasis on those in the form of easily computed finite sums involving spectral terms. Dissert. Abstr.

N78-20881 Kansas State Univ., Manhattan.

A TWO-STEP PROCEDURE FOR ANALYZING FIXED AND RANDOM EFFECTS NONLINEAR MODELS AND NONLINEAR ERRORS-IN-VARIABLE MODELS Ph.D. Thesis

Paulette Mae Johnson 1977 105 p

Avail: Univ. Microfilms Order No. 7800816

The procedure is applied to the fixed effects nonlinear model. Estimates of the parameters are found in cell by cell estimation using nonlinear least squares. Then, linear models relating to the design structure are constructed using the estimates as the dependent variables. This procedure is also applied to the random effects nonlinear model. A general linear random model can be constructed using values as dependent variables. Analysis can be carried out by various linear techniques where the asymptotic covariance matrices of the values again enter as weights. The procedure is extended to the errors-in-variable nonlinear model. Dissert. Abstr.

N78-20882 Oklahoma State Univ., Stillwater.

A BAYESIAN ANALYSIS OF A CHANGING LINEAR MODEL Ph.D. Thesis

Jaunita Hwa-ling-Tu Chin Choy 1977 86 p
Avail: Univ. Microfilms Order No. 7801225

The scope of this study is based on Bayesian approach to: (1) detect the presence of a change from one regression model to another; (2) estimate and make inferences about the shift point and other unknown parameters in a sequence of independent random variables which change regression models at an unknown point, and (3) estimate and make inferences about the abscissa of the intersection of two regression lines. Dissert. Abstr.

N78-20883# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
APPROXIMATION TECHNIQUES AND OPTIMAL DECISION MAKING FOR STOCHASTIC LANCHESTER MODELS
Peter Paul Perla, III (Center for Naval Analysis, Arlington, Va.) Jan. 1978 150 p refs
(Contract N00014-77-C-0161)
(AD-A050416; TR-137) Avail: NTIS HC A07/MF A01 CSCL 12/1

This thesis extends the analysis of stochastic Lanchester models beyond the stage of mere modeling. To this end, a framework of statistical decision theory is superimposed on a simplified combat situation. The commander must make decisions about the amount of force he will commit to a combat in reference to a suitable cost and reward structure. Problems of both the one-stage and the multi-stage variety are studied. The one-stage decision problem requires knowledge of the probability of victory and the expected number of survivors. A complete solution to this problem is given, based on the use of a martingale central limit theorem. The multi-stage decision problem requires the distribution of the force level configuration as a function of time. These distributions are approximated through the use of diffusion approximations. A two-stage problem is solved using these approximations and backward induction. GRA

N78-20884# Stanford Univ., Calif. Dept. of Statistics.
PRINCIPAL COMPONENTS IN THE NONNORMAL CASE: THE TEST FOR SPHERICITY
Christine M. Waternaux Oct. 1977 28 p refs
(Contract N00014-75-C-0442; Grant NSF MPS-75-09450)
(AD-A049622; SU-TR-31; SU-TR-122) Avail: NTIS HC A03/MF A01 CSCL 12/1

The limiting distribution of the likelihood ratio statistic W sub q for testing the hypothesis of equality of q characteristic roots of a covariance matrix for normal populations is studied for nonnormal populations. It is shown, both ,theoretically and empirically, that the limiting distribution of W sub q is not robust to departures from normality characterized by nonzero fourth cumulants and that W sub q cannot be used for these nonnormal populations. For the class of spherically symmetric populations, it is shown that the limiting distribution of W sub q is proportional to a chi-square under the null hypothesis of equality of q population roots and to a noncentral chi-square under an appropriate sequence of alternative hypotheses. A corrected test statistic, W sub q, whose limiting distribution is chi-square, is proposed to test the hypothesis of sphericity for the general class of spherically symmetric populations. Results of a Monte Carlo experiment conducted to compare the performances of W sub q and the tested test statistic W sub q are presented for various contaminated normal models at various sample sizes. It is demonstrated that there is little difference between W sub q and the tested test statistic W sub q for normal populations, but that dramatic improvements are gained by using the tested test statistic W sub q for the nonnormal populations. Author (GRA)

N78-20885# Princeton Univ., N. J. Dept. of Statistics.
CHARACTERISTIC STATISTICAL PROBLEMS OF STOCHASTIC GEOMETRY
G. S. Watson Aug. 1977 21 p refs
(Contract N00014-75-C-0453)
(AD-A049690; TR-130-Ser-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Buffon needle problem and some variations are used to illustrate classical statistical methods of estimation and to lead into, and contrast with, the problems which arise when a sample of some random structure is the data. The flavor of these problems is conveyed largely by discussion of the simplest, and most described, case, that of point processes. Author (GRA)

N78-20886# Princeton Univ., N. J. Dept. of Statistics.
ESTIMATING THE INTENSITY OF A POISSON PROCESS
G. S. Watson Sep. 1977 24 p refs
(Contract N00014-75-C-0453)
(AD-A049689; TR-131-Ser-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

A linear estimator minimizing the expected average mean square error is derived. This is generalized by adding to the criterion a multiple of the expected average squared pth difference. This leads to splines. Author (GRA)

N78-20887# Princeton Univ., N. J. Dept. of Statistics.
THE AGE OF A MARKOV PROCESS
Anthony G. Pakes Jul. 1977 39 p refs
(Contract N00014-75-C-0453)
(AD-A049691; TR-5-Ser-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

The concept of a limiting conditional age distribution of a continuous time Markov process whose state space is the set of non-negative integers and for which (0) is absorbing is defined as the weak limit as t approaches infinity of the last time before t an associated 'return' Markov process exited from (0) conditional on the state, j, of this process at t. The existence and some properties of the conditional age distribution are derived. The Markov branching process and general birth and death process are treated in some detail as examples. Author (GRA)

N78-20888# Princeton Univ., N. J. Dept. of Statistics.
LIMIT THEOREMS FOR THE SIMPLE BRANCHING PROCESS ALLOWING IMMIGRATION. 2: THE CASE OF INFINITE OFFSPRING MEAN
Anthony G. Pakes and A. D. Barbour (Cambridge Univ.) Dec. 1977 15 p refs
(Contract N00014-75-C-0453)
(AD-A049693; TR-134-Ser-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

Some limit theorems were obtained for the simple branching process allowing immigration (X sub n) when the offspring mean is infinite. It was shown that there exists a function U such that (E to the -nth power U(X sub n)) converges almost surely and if s = sigma b sub j log positive U(j) less than infinity, where (b sub j) is the immigration distribution, the limit is nondefective and nondegenerate but is infinite if s = infinity. When s = infinity limit theorems were found for (U(X sub n)) which involve a slowly varying nonlinear norming. Author

N78-20889# Stanford Univ., Calif. Information Systems Lab.
NEW RESULTS IN 2-D SYSTEMS THEORY. PART 3: RECURSIVE REALIZATION AND ESTIMATION ALGORITHMS FOR 2-D SYSTEMS Interim Report
B. Levy, M. Morf, and S. Y. Kung 1977 14 p refs
(Contract F44620-74-C-0068; N00014-75-C-0068; Grant NSF ENG-75-18952)
(AD-A050340; AFOSR-78-0141TR-Pt-3) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper realization procedures for 2-D systems are discussed from an input/output point of view (leaving the state-space approach for further studies). Stochastic as well as deterministic techniques of realization are presented. In the stochastic case the Levinson algorithm is generalized to the 2-D case. The 2-D Levinson recursions are related to similar recursions for 2-D orthogonal polynomials on the unit hyper circle generalizations of the Szego polynomials. These recursions are connected to the factorizations of the block covariance matrix in elements which are causal in each of the four quadrants. Furthermore, 2-D maximum-entropy spectral analysis techniques are discussed. From a deterministic standpoint several recursive partial realization schemes are considered, which represent fast solutions of the 2-D Pade approximation problem. These methods are extensions of the Lanczos recursions to the 2-D case. GRA

N78-20890# Louisiana State Univ., Baton Rouge. Dept. of Electrical Engineering.
STRUCTURAL INFERENCE AND IDENTIFICATION OF DISCRETE TIME SYSTEMS Interim Report. Ph.D. Thesis - Michigan Univ.

Anna Sylwia Zalecka-Melamed Nov. 1977 192 p refs
(Grants AF-AFOSR-3500-78; AF-AFOSR-3160-77; NSF MCS-76-3160)
(AD-A050336; AFOSR-78-0174TR) Avail: NTIS HC A09/MF A01 CSCL 09/3

This dissertation develops a general theory of coordinated sets and structured functions. This theory is then applied to structure inference and identification of discrete time systems with coordinated state spaces. Several measures of model performance such as structural confidence, predictive range and confidence are introduced. Author (GRA)

N78-20891# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ISOTONIC, CONVEX AND RELATED SPLINES Interim Report
Ian W. Wright (Papua and New Guinea Univ.) and Edward J. Wegman Nov. 1977 24 p refs
(Grant AF-AFOSR-2840-75; AF Proj. 2304)
(AD-A050362; Mimeo-Ser-1145; AFOSR-78-0179TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The estimation of isotonic, convex or related functions is considered by means of splines. It is shown that certain classes of isotone or convex functions can be represented as a positive cone embedded in a Hilbert space. Using this representation, an existence and characterization theorem are given for isotonic or convex splines. Two special cases are examined showing the existence of a globally monotone cubic smoothing spline and a globally convex quintic smoothing spline. Finally, a regression problem is examined and shows that the isotonic-type of spline provides a strongly consistent solution. Several other statistical applications are given. GRA

N78-20892# North Carolina Univ., Chapel Hill. Dept. of Statistics.
PROPERTIES OF CERTAIN SYMMETRIC STABLE DISTRIBUTIONS Interim Report
Grady W. Miller 1977 22 p refs
(Grant AF-AFOSR-2796-75; AF Proj. 2304)
(AD-A050374; AFOSR-78-0037TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Necessary and sufficient conditions are presented for jointly symmetric stable random vectors to be independent and for a regression involving symmetric stable random variables to be linear. The notion of n-fold dependence is introduced for symmetric stable random variables, and under this condition we determine all monomials in such random variables for which moments exist. Author (GRA)

N78-20893# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON SEQUENTIAL ESTIMATION OF THE LARGEST NORMAL MEAN WHEN THE VARIANCE IS KNOWN Interim Report
Raymond J. Carroll Sep. 1977 13 p refs
(Grant AF-AFOSR-2796-75; AF Proj. 2304)
(AD-A050377; Mimeo-Ser-1133; AFOSR-78-0049TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A class of stopping times is defined for estimating the largest of k normal means when the variance is known. The class can achieve significant reduction in sample size compared to a related procedure because it employs an elimination feature which halts sampling on populations furnishing no information about the largest mean. The asymptotic behavior of the stopping times and the mean square consistency of the estimators are studied. GRA

N78-20894# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON THE ASYMPTOTIC DISTRIBUTION OF MULTIVARIATE M-ESTIMATES Interim Report
Raymond J. Carroll Sep. 1977 16 p refs
(Grant AF-AFOSR-2796-75)
(AD-A050378; Mimeo-Ser-1134; AFOSR-78-0050TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The asymptotic distribution of multivariate M-estimates is studied. It is shown that, in general, consistency leads to asymptotic normality and a law of the iterated logarithm. The results are used to compute via matrix derivatives the asymptotic distribution of a class of estimates. GRA

N78-20895# North Carolina Univ., Chapel Hill. Dept. of Statistics.
SPLINES IN STATISTICS Interim Report
Ian W. Wright Nov. 1977 34 p refs
(Grant AF-AFOSR-2840-75)
(AD-A050324; Mimeo-Ser-1146; AFOSR-78-0178TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Spline functions are particularly appropriate in fitting a smooth non-parametric model to noisy data. The use of spline functions in non-parametric density estimation and spectral estimation is surveyed. The requisite spline theory background is also developed. Author (GRA)

N78-20896# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
STATE-ESTIMATION OF PARTIALLY-OBSERVED MARKOV CHAINS: DECOMPOSITION, CONVERGENCE, AND COMPONENT IDENTIFICATION Interim Report
Loren K. Platzman 15 Dec. 1977 44 p refs
(Grant AF-AFOSR-3281-77)
(AD-A050344; ESL-P-790; AFOSR-78-0184TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A partially-observed Markov chain (S,Y) consists of an N-state Markov chain S, along with a process Y of noisy observations of the transitions of S. A metric on stochastic N-vectors and a generalized ergodic coefficient on the transition probability matrices of (S,Y) are defined, resulting in a notion (similar to weak ergodicity) of deteriorating dependence on initial value in a process of distributions of the state (of S) conditioned on past observations. If (S,Y) is stationary, then S may be decomposed into M less than or = N components, where M = 1 neither implies nor is implied by ergodicity of S, such that conditional state distributions within each component geometrically approach an initial-value-independent process in the manner described above, and one or more equivalent components eventually dominate the others. A method for drift-free finite-memory approximation (or realization) of this process is also introduced. Author (GRA)

N78-20897# Stanford Univ., Calif. Dept. of Electrical Engineering.
SQUARE-ROOT ALGORITHMS FOR THE CONTINUOUS-TIME LINEAR LEAST SQUARES ESTIMATION PROBLEM Interim Report
M. Morf, B. Levy, and T. Kailath Dec. 1977 6 p refs
(Contracts F44620-74-C-0068; N00014-75-C-0601; AF Proj. 2304)
(AD-A050305; AFOSR-78-0146TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

A simple differential equation for the triangular square-root of the error covariance of the linear state estimator is derived. Previous algorithms involved an antisymmetric matrix in the square-root differential equation. In the constant model case, Chandrasekhar-type equations are shown to constitute a set of fast square-root algorithms for the derivative of the error variance. Square-Root algorithms for the smoothing problem are presented and as in the discrete case, an array method for handling continuous square-roots is developed. This method also yields very naturally the usual normalizations of stochastic calculus, suggesting extensions to more general stochastic equations, even to estimators for nonlinear models. Author (GRA)

N78-20898# Princeton Univ., N. J. Dept. of Statistics.
ON THE MAXIMUM AND ABSORBTION TIME OF LEFT-CONTINUOUS RANDOM WALK
Anthony G. Pakes Mar. 1977 14 p refs
(Contract N00014-75-C-0453)
(AD-A049687; TR-122-Ser-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a recent paper P.J. Green obtained some conditional limit theorems for the absorption time of left-continuous random walk. His methods required certain distributions to have exponentially decreasing tails. Here a different approach is taken to produce Green's results under minimal conditions. Limit theorems are

given for the maximum as the initial position of the random walk tends to infinity. Author (GRA)

N78-20899# Naval Postgraduate School, Monterey, Calif.
AN EXPONENTIAL AUTOREGRESSIVE-MOVING AVERAGE PROCESS EARMA(P,Q): DEFINITION AND CORRELATIONAL PROPERTIES
A. J. Lawrance and P. A. W. Lewis 9 Jan. 1978 40 p refs (RR0140501)
(AD-A050221; NPS55-78-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new model for pth-order autoregressive processes with exponential marginal distributions EAR(p) is developed and an earlier model for first order moving average exponential processes is extended to qth-order, given an EMA(q) process. The correlation structure of both processes are obtained separately. A mixed process, EARMA(p,q), incorporating aspects of both EAR(p) and EMA(q) correlation structures is then developed. The EARMA(p,q) process is an analog of the standard ARMA(p,q) time series models for Gaussian processes and is generated from a single sequence of independent and identically distribution exponential variables. Author (GRA)

N78-20900# Wisconsin Univ., Madison. Mathematics Research Center.
DYNKIN'S IDENTITY APPLIED TO BAYES SEQUENTIAL ESTIMATION OF A POISSON PROCESS
C. P. Shapiro and Robert L. Wardrop Oct. 1977 27 p refs (Contract DAAG29-75-C-0024)
(AD-A049422; MRC-TSR-1795) Avail: NTIS HC A03/MF A01 CSCL 12/1

Conditional on the value of theta, theta > 0, let X(t), t > or = 0, be a homogeneous Poisson process. Sequential estimation procedures of the form (sigma, theta-bar(sigma)) are considered. To measure loss due to estimation, a family of functions, indexed by p, is used: L(theta, theta-bar) = theta to the -pth power (theta-theta-bar) squared, and the cost of sampling involves cost per arrival and cost per unit time. The notion of 'monotone case' for total cost functions of a continuous time process is defined in terms of the characteristic operator of the process at the total cost function. The Bayes sequential procedure is then derived for those cost functions in the monotone case using extensions of Dynkin's identity for the characteristic operator. The properties of these procedures are studied as sampling costs tend to 0, and the procedures are then modified and compared with procedures which are optimal among all stopping rules terminating at arrivals. Author (GRA)

N78-20901# Wisconsin Univ., Madison. Mathematics Research Center.
BOUNDS FOR THE t-TAIL AREA
Andrew P. Soms Nov. 1977 19 p refs
(Contract DAAG29-75-C-0024)
(AD-A049385; MRC-TSR-1806) Avail: NTIS HC A02/MF A01 CSCL 12/1

The bounds for the upper tail area of the normal distribution are, with some modifications, extended to t-distribution. Comparisons between the bounds are made and some numerical examples are provided. GRA

N78-20902# Wisconsin Univ., Madison. Mathematics Research Center.
RATIONAL BOUNDS FOR THE t-TAIL AREA WITH AN APPLICATION TO BONFERRONI t-PERCENTILES
Andrew P. Soms Nov. 1977 22 p refs
(Contract DAAG29-75-C-0024)
(AD-A049386; MRC-TSR-1807) Avail: NTIS HC A02/MF A01 CSCL 12/1

The bounds for the normal distribution are extended to the t-distribution. It is shown how these bounds can be used to calculate the Bonferroni descriptive level as well as Bonferroni t-percentiles. The adequacy of the approximation is discussed and numerical examples provided. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N78-20903 Oregon State Univ., Corvallis.
ON THE STATE AND PARAMETER ESTIMATION OF STOCHASTIC BILINEAR SYSTEMS Ph.D. Thesis
Ali Shadman-Valavi 1977 141 p
Avail: Univ. Microfilms Order No. 77-29427

The state estimation problem for a continuous bilinear system with a continuous observation mode was studied and the results were extended to the case where the observations were of a discrete nature. It is shown that the optimal filter is of infinite dimension, and a sub-optimal solution based on the use of the conditional best estimate of the state in the multiplicative term, rather than the actual state, is proposed. The filter dimension was reduced to two and the mean and the variance equations were provided. A recursive maximum likelihood procedure operating on the proposed filter was used for the parameter identification. Both the likelihood functional and the gradient equations were provided. Computation of the gradient was dependent on computing the partial derivatives of the proposed filter equations with respect to the parameters. Dissert. Abstr.

N78-20904 Stanford Univ., Calif.
THE ASSESSMENT OF A JOINT PROBABILITY DISTRIBUTION ON AN EVOLVING DYNAMIC UNCERTAIN PROCESS Ph.D. Thesis
Dennis Melvin Buede 1977 147 p
Avail: Univ. Microfilms Order No. 78-02139

Multivariate named distributions are examined and found to be too rigid in their structure to be good approximations of the decision maker's joint probability distribution, in general. The major segment of this dissertation is devoted to the presentation of a method of assessing a joint probability distribution on a dynamic random variable. This method is a general model of the decision maker's use of new information to update his probabilistic beliefs. A mathematical framework for specifying a posterior distribution in terms of the prior distribution and the revealed information is introduced. This framework provides the analyst with a great deal of flexibility for approximating any joint distribution the decisionmaker might have. Dissert. Abstr.

N78-20905# Wisconsin Univ., Madison. Mathematics Research Center.
A DYNAMIC SOLUTION CONCEPT FOR ABSTRACT GAMES
Prakash P. Shenoy Nov. 1977 24 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS 75-17385)
(AD-A049383; MRC-TSR-1804) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several solution concepts have been defined for abstract games. Some of these are the core due to Gillies and Shapley, the von Neumann-Morgenstern stable sets due to von Neumann and Morgenstern, and the subsolutions due to Roth. These solutions concepts are rather static in nature. This paper proposes a new solution concept for abstract games called the dynamic solution that reflects the dynamic aspects of negotiation among players. Some properties of the dynamic solutions are studied. Also, the dynamic solution of abstract games arising from n-person cooperative games in characteristic function form is investigated. GRA

N78-20906# Wisconsin Univ., Madison. Mathematics Research Center.
ON COALITION FORMATION: A GAME-THEORETICAL APPROACH
Prakash P. Shenoy Nov. 1977 62 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS 75-17385)
(AD-A049384; MRC-TSR-1805) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper deals with the question of coalition formation in n-person cooperative games. Two abstract game models of coalition formation are proposed. The core and the dynamic solution of these abstract games are then studied. These models assume that there is a rule governing the allocation of payoffs

to each player in each coalition structure called a payoff solution concept. The predictions of these models are characterized for the special case of games with side payments using various payoff solution concepts such as the individually rational payoffs, the core, the Shapley value and the bargaining set M sub 1 superscript (i). Some modifications of these models are also discussed. GRA

N78-20907# University of Southern Calif., Los Angeles. Dept. of Economics.
THE EQUIVALENCE OF TEAM THEORY'S INTEGRAL EQUATIONS AND A CAUCHY SYSTEM: SENSITIVITY ANALYSIS OF A VARIATIONAL PROBLEM Interim Report
Alireza Akbari, James Hess, Harriet Kagiwada, and Robert Kalaba 1977 28 p refs
(Grant AF-AFOSR-3383-77)
(AD-A050385; MRG-7717) Avail: NTIS HC A03/MF A01 CSCL 12/2

Team decision theory studies the problem of how a group of decision makers should use information to coordinate their actions. Mathematically, the task is to find functions that maximize an objective functional. The Euler equations take the form of a system of integral equations. In this paper, it will be shown that a class of such integral equations have solutions that are identical to the solutions of a system of initial valued integrodifferential equations. This Cauchy system describes the sensitivity of the solutions to underlying parameters and provides an efficient technique for solving difficult team decision problems. An analysis of a profit maximizing firm demonstrates the usefulness of the Cauchy system. Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N78-20908 Notre Dame Univ., Ind.
THE ISOMORPHISM THEORY OF PROJECTIVE PSEUDO-ORTHOGONAL GROUPS Ph.D. Thesis
Kam Wing Leung 1977 153 p
Avail: Univ. Microfilms Order No. 77-27842

It is explained how the notion of pseudo-orthogonal groups embraces all the classical groups that arise from forms, and exactly when does it give rise to new classical groups. Then the isomorphism theory of these groups (excluding non-defective orthogonal groups) is investigated. The main results are two theorems. Dissert. Abstr.

N78-20909 Iowa Univ., Iowa City.
FIXED POINT THEOREMS AND SURJECTIVITY RESULTS FOR NONLINEAR MAPPINGS IN BANACH SPACES Ph.D. Thesis
David John Downing 1977 67 p
Avail: Univ. Microfilms Order No. 77-28445

Fixed point theorem 2.6 is discussed and applied to obtain surjectivity results for nonlinear closed mappings f: X yields Y, where X and Y are Banach Spaces, and for the class of phi-accretive set-valued mappings under less stringent continuity conditions than previously imposed. Dissert. Abstr.

N78-20910 Yale Univ., New Haven, Conn.
TENSOR PRODUCTS OF MODULES FOR LIE ALGEBRAS Ph.D. Thesis
Alex Jay Feingold 1977 62 p
Avail: Univ. Microfilms Order No. 77-28024

It is shown that algorithms for decomposing a tensor product of two finite dimensional irreducible modules for a complex semisimple Lie algebra into a direct sum of irreducibles imply that for a fixed irreducible module V sub lambda the set of all tensor products of V sub lambda with any V sub tau is completely determined by a specific finite set of such tensor products. Significant further reductions are found in the number of calculations needed to determine the decompositions of this finite set of tensor products. Also, a pattern of monotonicity is seen to be present in the multiplicities of certain summands. How this new information affects computer programs written for investigating these decompositions is briefly discussed. Dissert. Abstr.

N78-20911# IBM Watson Research Center, Yorktown Heights, N.Y.
ON THE GROUP PROBLEM AND A SUBADDITIVE APPROACH TO INTEGER PROGRAMMING Interim Report
Ellis L. Johnson 1977 28 p refs
(Contract F49620-77-C-0014; AF Proj. 2304)
(AD-A050346; AFOSR-78-0172TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The study of Gomory's group problem has led to a subadditive approach to integer programming. This paper traces that development using the cyclic group problem and knapsack problem as prototypes. The asymptotic theorem of Gomory is also discussed. Finally, an algorithm giving a constructive proof of a subadditive dual problem for the knapsack problem is presented. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N78-20912 California Univ., Berkeley.
THE DEVELOPMENT OF LARGE HIGH CURRENT DENSITY SUPERCONDUCTING MAGNETS FOR USE IN HIGH ENERGY PHYSICS EXPERIMENTS Ph.D. Thesis
Michael Anthony Green 1977 275 p
Avail: Univ. Microfilms Order No. 77-31250

A large superconducting solenoid magnet, characterized by very high current density windings and a two-phase helium tubular cooling system which eliminates most of the problems found in the cryogenic systems of large superconducting magnets was designed to operate at current densities below 10 the 8th power/sq Am. Using a closely coupled, low resistance bore tube to remove most of the current in the superconducting coil without developing high transient voltages. The design and the construction of two test solenoids are described. The successful test of the superconducting coil and its tubular cooling refrigeration system is discussed as well as the safety, environmental and economic impacts of the test program on future developments in high energy physics. Dissert. Abstr.

N78-20913 Pittsburgh Univ., Pa.
THEORETICAL PROBLEMS IN MAGNETISM Ph.D. Thesis
Marek Cieplak 1977 179 p
Avail: Univ. Microfilms Order No. 7801856

The magnetic properties of materials with large anisotropy fields but small exchange fields are analyzed. These systems are either paramagnetic or ordered ones. The use and limitations of the matrix elements matching method when using multi-boson spin representations to describe spin-wave excitations in systems with weak field exchange fields are discussed, as well as the possible effects of an oscillatory field on systems with weak exchange coupling. A theory for systems with weak antiferromagnetic exchange fields is developed and systems with large, but transversely anisotropic antiferromagnetic exchange fields are analyzed. The spontaneous magnetic moment in some finite range of concentrations of mixed valency crystals is examined. Dissert. Abstr.

N78-20914*# Tennessee State Univ., Nashville.
PULSE ANALYSIS OF ACOUSTIC EMISSION SIGNALS
J. R. Houghton and P. F. Packman Dec. 1977 182 p refs
(Grants NsG-8012; AF-AFOSR-2737-74)
(NASA-CR-2927; M-238) Avail: NTIS HC A09/MF A01 CSCL 20A

A method for the signature analysis of pulses in the frequency domain and the time domain is presented. Fourier spectrum, Fourier transfer function, shock spectrum and shock spectrum ratio were examined in the frequency domain analysis and pulse shape deconvolution was developed for use in the time domain analysis. Comparisons of the relative performance of each analysis technique are made for the characterization of acoustic emission

pulses recorded by a measuring system. To demonstrate the relative sensitivity of each of the methods to small changes in the pulse shape, signatures of computer modeled systems with analytical pulses are presented. Optimization techniques are developed and used to indicate the best design parameter values for deconvolution of the pulse shape. Several experiments are presented that test the pulse signature analysis methods on different acoustic emission sources. These include acoustic emission associated with (a) crack propagation, (b) ball dropping on a plate, (c) spark discharge, and (d) defective and good ball bearings. Deconvolution of the first few micro-seconds of the pulse train is shown to be the region in which the significant signatures of the acoustic emission event are to be found.
Author

N78-20915# Los Alamos Scientific Lab., N. Mex.
DESIGN FOR COORDINATED MEASUREMENTS OF FARADAY ROTATION AND LINE-OF-SIGHT ELECTRON DENSITY USING HETERODYNE TECHNIQUES
A. R. Jacobson Jul. 1977 8 p refs
(Contract W-7405-eng-26)
(LA-6875-MS) Avail: NTIS HC A02/MF A01

A device which can overcome certain of the compromises of conventional Faraday rotation methods and at the same time measure the optical phase as well as the polarization is reported. This would be useful for unfolding the Faraday rotation signal using the line-of-sight density along exactly the same path. Preliminary design parameters using a CO2 laser are presented.
ERA

N78-20916# National Centre of Tribology, Risley (England). European Space Tribology Lab.
THERMAL VACUUM TEST ON A PROTOTYPE TELDIX DOUBLE-GIMBALLED MOMENTUM WHEEL
K. Parker Paris ESA Sep. 1977 51 p
(Contract ESTEC-3009/76-NL-MD)
(ESA-ESTL-28; ESA-CR(P)-1021) Avail: NTIS HC A04/MF A01

A prototype Teldix double-gimballed momentum wheel (DGMW) was tested under vacuum for short periods of accelerated gimbal motion at both isothermal temperature and various thermal gradients. The anticipated daily oscillation of the spin axis of the wheel was simulated and accelerated by imposing a square cone motion on the two gimbal axes for periods of approximately 10 min. During the duration of the tests, a total of 20 days of motion was completed. A detailed investigation was carried out into the characteristics of the interaction between the roll and yaw gimbals, the so-called disturbance torques. In general there were only minor variations in torques from one test sequence of accelerated motion to another and no overall change in performance was recorded. The disturbance torques were usually greater at low temperatures than at high temperatures, which can be associated with an increase in the viscosity of the oil used in the gimbal bearings; however, they were normally less than the specified maximum acceptable levels except for the occasional high torques which occurred for short periods at the commencement of gimbal motion following stationary periods of several hours allowed for thermal stabilization of the mechanism. Such torques could be caused by excess oil in the bearings which were redistributed in the subsequent gimbal motion.
Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N78-20917*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPARISON OF MEASURED AND CALCULATED HELICOPTER ROTOR IMPULSIVE NOISE
Wayne Johnson and Albert Lee (Beam Eng., Inc.) Mar. 1978 29 p refs
(Contract NAS2-9399)
(NASA-TM-78473; A-7355) Avail: NTIS HC A03/MF A01 CSCL 20A

The thickness noise theory is discussed. Two full-scale rotors were tested in a wind tunnel with several tips involving changes in chord, thickness, and sweep. Impulsive noise data reduction procedures used are described. The calculated and measured impulsive noise peak pressures as a function of advancing tip Mach number are compared, showing good correlation for all rotors considered.
Author

N78-20918*# Beam Engineering, Inc., Sunnyvale, Calif.
ACOUSTICAL EFFECTS OF BLADE TIP SHAPE CHANGES ON A FULL SCALE HELICOPTER ROTOR IN A WIND TUNNEL
Albert Lee Apr. 1978 59 p refs
(Contract NAS2-9399)
(NASA-CR-152082) Avail: NTIS HC A04/MF A01 CSCL 20A

Four tip shapes were tested. They were rectangular, swept, tapered, and swept-tapered. The measured data covered a wide range of operating conditions. The range of advancing tip Mach numbers were between 0.72 to 0.96, and the advance ratios were from 0.2 to 0.375. At low and moderate advancing tip Mach number, the data in the dbA scale appear to indicate the swept tip is the quietest, swept tapered the second, tapered third and rectangular the most noisy. Above an advancing tip Mach number of about 0.89, a distinct acoustical pulse can be observed, which dominates the acoustical waveform. The pulse shape is symmetric at moderate tip Mach number, changing to a sawtooth shape at high advancing tip Mach numbers. Based on the amplitude of the impulsive noise, it appears the swept-tapered tip is the quietest, tapered tip the second, swept tip third and square tip the most noisy. The data presented in this report should be useful as data bases for modeling and evaluating helicopter impulsive noise.
Author

N78-20919*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CONCORDE NOISE-INDUCED BUILDING VIBRATIONS, JOHN F. KENNEDY INTERNATIONAL AIRPORT
W. H. Mayes, R. DeLoach, D. G. Stephens, J. M. Cawthorn, H. K. Holmes, R. B. Lewis, B. G. Holliday, W. T. Miller, and D. W. Ward Feb. 1978 67 p refs
(NASA-TM-78676; Rept-2) Avail: NTIS HC A04/MF A01 CSCL 20A

The outdoor/indoor noise levels and associated vibration levels resulting from aircraft and nonaircraft events were recorded at eight homesites and a school. In addition, limited subjective tests were conducted to examine the human detection/annoyance thresholds for building vibration and rattle caused by aircraft noise. Presented herein are the majority of the window and wall vibration data recorded during Concorde and subsonic aircraft overflights.
Author

N78-20920*# United Technologies Research Center, East Hartford, Conn.
A METHOD FOR CALCULATING EXTERNALLY BLOWN FLAP NOISE Final Report
Martin R. Fink Mar. 1978 130 p refs
(Contract NAS3-17863)
(NASA-CR-2954; R77-911739-17) Avail: NTIS HC A07/MF A01 CSCL 20A

Several basic noise components were described. These components are: (1) compact lift dipoles associated with the wing and flaps; (2) trailing edge noise associated with the last trailing edge; and (3) quadrupole noise associated with the undeflected exhaust jet and the free jet located downstream of the trailing edge. These noise components were combined to allow prediction of directivity and spectra for under the wing (UTW) slotted flaps with conventional or mixer nozzles, UTW slotless flaps, upper surface blowing (USB) slotless flaps, and engine in front of the wing slotted flaps. A digital computer program listing was given for this calculation method. Directivities and spectra calculated by this method were compared with free field data for UTW and USB configurations. The UTRC method best predicted the details of the measured noise emission, but the ANOP method best estimated the noise levels directly below these configurations.
Author

N78-20921*# United Technologies Research Center, East Hartford, Conn.
A METHOD FOR CALCULATING STRUT AND SPLITTER PLATE NOISE IN EXIT DUCTS: THEORY AND VERIFICATION Final Report
Martin R. Fink Mar. 1978 81 p refs
(Contract NAS3-17863)
(NASA-CR-2955; R77-911739-18) Avail: NTIS HC A05/MF A01 CSCL 20A

Portions of a four-year analytical and experimental investigation relative to noise radiation from engine internal components in turbulent flow are summarized. Spectra measured for such airfoils over a range of chord, thickness ratio, flow velocity, and turbulence level were compared with predictions made by an available rigorous thin-airfoil analytical method. This analysis included the effects of flow compressibility and source noncompactness. Generally good agreement was obtained. This noise calculation method for isolated airfoils in turbulent flow was combined with a method for calculating transmission of sound through a subsonic exit duct and with an empirical far-field directivity shape. These three elements were checked separately and were individually shown to give close agreement with data. This combination provides a method for predicting engine internally generated aft-radiated noise from radial struts and stators, and annular splitter rings. Calculated sound power spectra, directivity, and acoustic pressure spectra were compared with the best available data. These data were for noise caused by a fan exit duct annular splitter ring, larger-chord stator blades, and turbine exit struts. Author

N78-20922# Georgetown Univ., Washington, D.C. Dept. of Physics.
SONIC REFLECTION FROM SOLID PLATES Technical Report, 1 May - 31 Dec. 1977
Walter G. Mayer, Leslie E. Pitts, Neal G. Brower, and M. Behravesh 31 Jan. 1978 17 p refs
(Contract N00014-75-C-0333)
(AD-A050418; GUUS-12778; TR-8) Avail: NTIS HC A02/MF A01 CSCL 20/1

Theoretical development for reflection effects for a bounded ultrasonic beam from flat interfaces and plates. Experimental observations for reflection from thick solid plates. Author (GRA)

N78-20923# Naval Postgraduate School, Monterey, Calif.
INTRODUCTION OF ACOUSTIC SIGNAL PROCESSING
George L. Sackman, William O. Davis, and Paul H. Donaldson Nov. 1977 168 p refs
(AD-A050010; NPS-62SA77111) Avail: NTIS HC A08/MF A01 CSCL 20/1

Acoustic Signal processing is a short course in electrical signal processing fundamentals and their applications in the field of underwater acoustics. It contains an introduction to Fourier transforms and their properties, sampling and quantization, filters and bandwidth requirements, random signals and noise, and an introduction to four types of processing equipment; the DELTIC, energy detectors, correlation detectors, and beamformers. Course objectives are given in terms of specific questions which a person completing the course should be able to answer. The course is designed to be presented to the personnel involved with the development, operation and employment of acoustic sensors to provide them with a better understanding of the operations accomplished by their equipment and to develop in them a better appreciation of the problems and limitations associated with signal detection in the underwater environment. Author (GRA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N78-20924 City Univ. of New York.
EFFECTS OF MOLECULAR STRUCTURE ON QUENCHING REACTIONS Ph.D. Thesis
Sze-Ming Y. Huang 1977 169 p
Avail: Univ. Microfilms Order No. 7732044

The geometric isomers of the asymmetric beta-diketonate complexes of Co(III) and Cr(III) have identical electronic spectra, but differ in their molecular structures. These geometric isomers then provide a unique opportunity to study the effect of structure without a concurrent uncertainty due to differences in their electronic structures. The effect of molecular structure on the quenching of the luminescent charge transfer states of Ru(bipy)3(2+) and Ru(bipic)3(2+) was studied with eight geometric beta-diketonate isomers of Co(III) and Cr(III). Using the same geometric isomers, the effect of molecular structure on the quenching of the triplet states of five organic donors was studied. Quenching efficiency increases with the triplet state energies of the donors and is discussed in terms of energy transfer mechanism. Dissert. Abstr.

N78-20925 California Univ., Berkeley.
CROSSED MOLECULAR BEAMS CHEMISTRY Ph.D. Thesis
Andrew Freedman 1977 181 p
Avail: Univ. Microfilms Order No. 77-31358

Several chemical systems were studied under single collision conditions in a crossed molecular beams apparatus which was capable of angular and velocity resolution of scattered species. Sources of the beams include a supersonic nozzle and a versatile high temperature oven capable of reaching 200 K. Analysis of reactive scattering in these experiments was described in detail, including product velocity data derived from time of flight spectra. Interpretation of these spectra was complicated by a detector response function; appropriate analytic expressions for this response function were developed and their incorporation into the data analysis delineated. Dissert. Abstr.

N78-20926 Connecticut Univ., Storrs.
DETERMINATION OF THE ANISOTROPY OF THE LONG-RANGE ATOM-MOLECULE POTENTIAL FROM MEASURED CROSS-SECTION RATIOS FOR ORIENTED LiF MOLECULES SCATTERING FROM INERT GAS TARGETS Ph.D. Thesis
Francis Raphael Menotti 1977 226 p
Avail: Univ. Microfilms Order No. 7731200

The anisotropy of the long-range potential between LiF and several of the inert gases (He, Ne, A, Kr) was studied in an experiment in which the ratios of the total scattering cross-sections for LiF molecules in two different average orientations were determined. The targets were contained in a scattering cell through which a velocity filtered beam of LiF molecules in the rotational state was allowed to pass. An electric field in the scattering region was alternately directed parallel to and perpendicular to the beam axis. In following the changing direction of the quantization axis adiabatically, the molecules were presented to the targets in a different average orientation for each field direction. The cross-section ratios obtained under these conditions represent averages over a distribution of target velocities, and must be extrapolated to the ratios for stationary targets. Dissert. Abstr.

N78-20927*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE OPTICAL ABSORPTION OF TRIATOMIC CARBON C3 FOR THE WAVELENGTH RANGE 260 TO 560 nm
Jim J. Jones Mar. 1978 61 p refs
(NASA-TP-1141; L-11871) Avail: NTIS HC A04/MF A01 CSCL 20H

The spectral absorption properties of C3 have been measured in a shock tube containing a test gas mixture of acetylene diluted with argon. The absorption of a pulsed xenon light source was measured by means of eight photomultiplier channels to a spectrograph and an accompanying drum camera. The postshock test gas temperature and pressure were varied over the range 3240 to 4300 K and 37 to 229 kPa, respectively. The results showed appreciable absorption by C3 for the wavelength range 300 to 540 nm. The various reported measurements of the heat of formation of C3 which are available in the open literature were reviewed, and a value of 198 kcal/mol is recommended. This value, along with best available values for other species, was used to calculate the number density of C3 for the conditions of the present experiments in order to compute absorption cross section or electronic oscillator strength. The computed electronic

oscillator strength varied from a high of 0.062 at 3300 K to a low of 0.036 at 3900 K. Author

N78-20928*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ABSOLUTE RATE OF THE REACTION OF HYDROGEN ATOMS WITH OZONE FROM 219-360 K
J. H. Lee, J. V. Michael, W. A. Payne, and L. J. Stief Mar. 1978 19 p refs Submitted for publication
(NASA-TM-78102) Avail: NTIS HC A02/MF A01 CSCL 20H

Absolute rate constants for the reaction of atomic hydrogen with ozone were obtained over the temperature range 219-360 K by the flash photolysis-resonance fluorescence technique. The results can be expressed in Arrhenius form by K = (1.33 plus or minus 0.32)x10 to the minus 10 power exp (-449 plus or minus 58/T) cu cm/molecule/s (two standard deviations). The present work is compared to two previous determinations and is discussed theoretically. Author

N78-20929# Ballistic Research Labs., Aberdeen Proving Ground, Md.
QUANTUM CHEMISTRY, CHEMISORPTION, AND EROSION. 1: PROPERTIES OF DIATOMIC MOLECULES
D. A. Ringers and J. B. Danese, Jr. Oct. 1977 36 p refs
(AD-A050249; BRL-2023) Avail: NTIS HC A03/MF A01 CSCL 20/8

A method has been developed for performing accurate total energy calculations using the X-alpha theory without the usual arbitrariness in selection of calculational parameters. The use of relatively high alpha-values and atomic sphere radii in the ratio of their atomic (covalent) radii led to results in agreement with experiment for dissociation energies and equilibrium separation distances in NO, CO, and SN. In addition, a method of obtaining dipole moments is given. The importance of these quantities in a model of erosion is discussed along with suggestions for further research. Author (GRA)

N78-20930# Wright State Univ., Dayton, Ohio. Brehm Lab.
LIGHT EMISSION PRODUCED BY REACTIONS BETWEEN RARE GAS IONS AND FLUORINE-CONTAINING GASES Final Report, 15 Jun. 1976 - 15 Jun. 1977
E. Grant Jones and Gary D. Sides 15 Aug. 1977 55 p refs Submitted for publication
(Grant AF-AFOSR-3064-76)
(AD-A050334; AFOSR-78-0105TR; Rept-76-146) Avail: NTIS HC A04/MF A01 CSCL 07/2

The research project reported here was undertaken in an effort to determine whether excited rare gas halides, specifically, KrF and ArF, could be produced by ion-molecule reactions between the rare gas atomic ions and fluorine-containing gases such as F2, NF3, and SF6. No excited rare gas halide emissions were observed for any of the systems studied. Emissions resulting from the ion-molecule reactions investigated were all atomic and could be assigned to He, F, F+, Ar, Ar+, Kr, Kr+, N or N+ transitions. Author (GRA)

N78-20931# California Univ., Santa Barbara. Quantum Inst.
RADIATION AND LASER POTENTIAL OF HOMO- AND HETERO-NUCLEAR RARE-GAS DIATOMIC MOLECULES Annual Technical Report, 1 Oct. 1976 - 1 Oct. 1977
William C. Walker and Yoshio Tanaka 1 Dec. 1977 15 p
(Grant AF-AFOSR-3137-77)
(AD-A050465; AFOSR-78-0175TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

Emission spectra from the vacuum ultraviolet to the visible region have been obtained from the rare gas dimers of helium, neon, argon and krypton and from the xenon oxide excimer. Several new discrete and diffuse bands together with both structured and unstructured continua have been observed and some have been tentatively identified with specific electronic states of the molecule. Several of these spectra appear only under specific excitation conditions and were thus revealed in this research for the first time. Significant new results for helium and argon dimers have been obtained. A study of the higher excited states of rare gas - oxide and sulfide excimer is underway. Author (GRA)

N78-20932# Rice Univ., Houston, Tex. Dept. of Chemistry.
INELASTIC AND REACTIVE COLLISIONS OF TRANSLATIONALLY EXCITED MOLECULES Final Report, 1 Apr. 1974 - 30 Sep. 1977
Philip R. Brooks Nov. 1977 7 p refs
(Grant AF-AFOSR-2692-74)
(AD-A050457; AFOSR-78-0109TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

It is shown that for the prototype system K+HCl = KCl + H, one quantum of vibrational excitation accelerates the reaction about two orders of magnitude, and that translational energy is only about 10 percent as effective as a comparable amount of vibrational energy. The input of an excess of translational energy is shown to decrease the reaction probability. The state-to-state rate constant is found to vary exponentially with -(E prime)1/2, where E prime is the translational energy in excess of the thermodynamic requirement. Author

N78-20933# IRT Corp., San Diego, Calif.
LOW ENERGY ATOMIC COLLISIONS Final Report, 1 Jul. - 30 Sep. 1977
Roy H. Neynaber Nov. 1977 13 p refs
(Contract F44620-74-C-0002)
(AD-A050456; IRT-8096-010; AFOSR-78-0108TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

Measurements were made using either crossed or merging molecular beams. For the chemi-ionization reactions the relative energy of the reactants was varied from 0.01 to 10 eV, whereas for some of the ion-molecule processes energies of several hundred electron volts were used. The reactants included ground-state and metastable He, Ne, and Ar and H, D, N+, O+, Na, Kr, CO, NO, H2+, D2+, and HeD+. Measurements of absolute and relative cross sections as well as energy distributions of product ions were obtained. Unique techniques that were developed for studying the above reactions are described. In addition, general observations are made of the dynamics, cross sections, branching ratios, etc., for these processes. The studies were made to gain a better understanding of the dynamics of low energy atomic collisions and to attempt to define the role played by the kinetic and internal energy of reactants. Another goal of the program was to provide data to assist in the formulation of theory. GRA

N78-20934# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
HIGHLY EXCITED ATOMS Final Report, 1 Apr. 1972 - 30 Sep. 1977
Daniel Kleppner 17 Nov. 1977 10 p refs
(Contract F44620-72-C-0057)
(AD-A050427; AFOSR-78-0106TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

The major accomplishment under this contract was the innovation of techniques for the production and detection of highly excited atoms (Rydberg atoms), and a series of studies on the properties of Rydberg atoms in strong electric fields. Partly as a result of this work, the study of Rydberg systems has developed into an important new subfield of atomic physics during the past few years; already there have been two international meetings and several sessions at national meetings devoted to the subject. Much of the experimental work uses the combination of field ionization and atomic beams techniques developed under this contract. Author (GRA)

N78-20935# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COHERENCE RETENTION DURING ROTATIONALLY INELASTIC COLLISIONS OF SELECTIVELY EXCITED DIATOMIC SULFUR
Thomas A. Caughey and David R. Crosley Oct. 1977 33 p refs
(AD-A050309; BRL-2021) Avail: NTIS HC A03/MF A01 CSCL 07/4

There is ample experimental evidence for the presence of non-equilibrium population distributions, and the occurrence of non-Arrhenius reaction rate behavior, in a wide variety of combustion processes. A full understanding of such systems on a microscopic level requires that such effects be addressed. Recent experiments are now just beginning to provide information

on the detailed quantum level dependence of inelastic and reactive collisions for a number of small molecules. However, the difficulty involved in carrying out such experiments means that theoretical computations of such rates will continue to be important for a number of systems. It is in turn crucial to have at hand experimental evidence concerning details of the collision dynamics which place constraints upon the theoretical formulations. GRA

N78-20936# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
COHERENT ANTI-STOKES RAMAN SCATTERING OF MOLECULAR GASES Final Report, 1 Mar. 1975 - 30 Apr. 1977
Won B. Roh Aug. 1977 116 p refs
(Contract F33615-75-C-1116)
(AD-A050156; SRL-6856; AFAPL-TR-77-47) Avail: NTIS HC A06/MF A01 CSCL 20/6

An experimental system based upon a single-mode ruby laser and a ruby-pumped dye laser has been developed to investigate coherent anti-Stokes Raman scattering (CARS) of molecular gases. The CARS system is capable of both broad- and narrow-band operation. Theoretical and experimental results obtained using this system for such gases as H2, HF, CO, N2, and CH4 are given. In particular, real-time CARS spectra of these gases have been obtained for rotational temperature estimations and the pressure dependence of integrated CARS intensity has been determined. In addition, the effect of media turbulence upon laser-beam propagation and upon the CARS process has been investigated. Results of CARS measurements on a laboratory rocket-engine plume are also presented. Author (GRA)

N78-20937# Wisconsin Univ., Madison. Mathematics Research Center.
OPERATOR-VALUED CHANDRASEKHAR H-FUNCTIONS
C. T. Kelley Dec. 1977 15 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-75-17385)
(AD-A049496; MRC-TSR-1813) Avail: NTIS HC A02/MF A01 CSCL 18/11

Operator valued analogs of the Chandrasekhar H-function that occur in the study of neutron transport in a slab with continuous energy dependence and anisotropic scattering satisfy a system of nonlinear integral equations. An appropriate Banach space setting is found for the study of this system. The system may be solved by iteration. The domain of analyticity of H sub r and H sub l is extended by means of bifurcation theory. GRA

N78-20938# Rochester Univ., N. Y. Dept. of Chemistry.
THEORETICAL AND COMPUTATIONAL STUDIES OF ELECTRIC TRANSITIONS IN MOLECULAR COLLISIONS Final Technical Report, 15 May 1974 - 14 Nov. 1977
Thomas F. George 13 Jan. 1977 15 p refs
(Contract F44620-74-C-0073)
(AD-A050380; AFOSR-78-0162TR) Avail: NTIS HC A02/MF A01 CSCL 20/10

Semiclassical and quantum mechanical methods were developed to describe energy transfer and reaction dynamics in molecular collision systems. Emphasis was given to processes involving electronic transitions and the dynamic coupling of two or more potential energy surfaces. Calculations were carried out for reactive collisions of a proton with deuterium molecule and reactive collisions of fluorine atom in its excited spin-orbit state with hydrogen molecule. Calculations were also performed for nonreactive collisions of halogen atoms with hydrogen molecule, where resonance behavior in electronic-to-rotational energy transfer was observed for the case of fluorine atom, and likewise in electronic-to-vibrational energy transfer for the case of bromine atom. The semiclassical and quantum mechanical methods were extended to the study of molecular collision processes in the presence of intense laser radiation (power density greater than a megawatt per square centimeter). This study revealed that such radiation can have dramatic effects on the dynamics of energy transfer and chemical reactions. GRA

N78-20939# Westfield Coll., London (England). Dept. of Physics.
ELASTIC AND INELASTIC EFFECTS IN PROTON-PROTON SCATTERING FROM STATES OF PURE SPIN
Metin Arik and Peter Glyn Williams Nov. 1977 39 p refs
Sponsored in part by Brit. Sci. Res. Council
Avail: NTIS HC A03/MF A01

Modified phase shift analyses of pp scattering are presented at p sub b = 1.25 and 1.66 GeV/c and shown to give large negative elastic effects in delta sigma (tot) sub L. Using a combination of phase shift analyses from low energies up to 1.66 GeV/c and simple models of both elastic (pp produces pp) and inelastic (pp produces N delta) scattering it is concluded that the measured behavior of delta sigma (tot) sub L is mostly inelastic; but the large negative value of delta sigma (tot) sub L is predominantly elastic with fluctuations produced by inelastic effects. No evidence for a dibaryon resonance was found.
Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N78-20940 Colorado State Univ., Fort Collins.
NUCLEAR OVERHAUSER EFFECTS IN EXCHANGING SYSTEMS Ph.D. Thesis
Marie Borzo 1977 451 p
Avail: Univ. Microfilms Order No. 77-28293

The development of expressions for the time derivatives of the magnetizations for a system of any number of any type of spin-1/2 nucleus exchanging between two configurations is discussed. Several examples illustrating the use of these expressions are presented with particular emphasis on possible nuclear Overhauser effect experiments. Topics include: the conformational exchange in dimethylformamide which is due to rotation about the C-N bond, and the chemical exchange in an aqueous solution of Cd(NO3)2. Dissert. Abstr.

N78-20941# International Institute for Applied Systems Analysis, Laxenburg (Austria).
FUSION AND FAST BREEDER REACTORS
D. Faude, ed. (Ges. fuer Kernforsch.), M. Helm, ed., and W. Weisz, ed. Jul. 1977 519 p refs
(IIASA-RR-77-8) Avail: NTIS HC A22/MF A01

The liquid-metal fast breeder reactor (LMFBR) and the deuterium-tritium (Tokamak) fusion reactor were compared. Both nuclear reactors can potentially produce practically unlimited amounts of energy. This relates exactly to the theme of IIASA's Energy Program, which studies the transition from today's supply systems that use limited but cheap resources to future supply systems that will use unlimited but possibly expensive means for the supply of large amounts of energy. Topics include the problem of fuel resources; present status of fission and fusion reactors; reference reactor systems; radioactive inventories of reactor economics; normal operating losses and exposures; nonroutine releases; safeguards; materials and impact of radiation damage; and requirements for commercialization. For individual titles, see N78-20942 through N78-20943.

N78-20942# Academy of Sciences (USSR), Moscow. Inst. of High Temperature.
A TOKAMAK REACTOR AND AN MHD ENERGY CONVERSION SYSTEM (THE TVE-2500 PROJECT)
D. K. Kurbatov, G. E. Shatalov, and N. N. Vasiliev *In* Intern. Inst. for Appl. Systems Anal. Fusion and Fast Breeder Reactors Jul. 1977 p 163-171 refs (For availability see N78-20941 11-73)
Avail: NTIS HC A22/MF A01

Design studies for a fusion power plant equipped with a Tokamak reactor are reported. The main characteristic features of the project under consideration are gas cooling at coolant temperatures up to 1800 to 2100 K, and incorporation of the solid-graphite ceramic blanket. With such high working medium temperatures, MHD generators can be used; these generators have high thermodynamic efficiencies and are costly compared to traditional power plants. Moreover, the realization of the high-temperature gas cooling process suggests using the plant

as a high-temperature heat source in industry (in metallurgy, chemical hydrogen production, etc.). Neon was chosen as a gas coolant in the solid ceramic blanket and is used as a working medium in the heat power cycle of the plant. After power production in the MHD generator, where about one third of the initial enthalpy is converted into electricity, the working medium successively passes through the thermo-mechanical components: steam generator, recuperative heat exchanger; then the neon is forced back to the reactor. The compressor is driven by the turbine supplied with steam from the steam generator.
Author (ESA)

N78-20943# Academy of Sciences (USSR), Moscow. Inst. of High Temperature.
THE LASER FUSION REACTOR DESIGN LTB-500
R. R. Grigoriants *In* Intern. Inst. for Appl. Systems Anal. Fusion and Fast Breeder Reactors Jul. 1977 p 172-180 refs (For availability see N78-20941 11-73)
Avail: NTIS HC A22/MF A01

The aim of the LTB-500 project, described briefly, is to determine the preliminary technical and economic indices of a fusion power station with laser initiation. Basic equipment consists of a thermonuclear reactor with laser initiation, wetted wall, condensing turbine K-300-240, and an electric discharge CO2 laser.
ESA

N78-20944# Sandia Labs., Albuquerque, N. Mex.
POWER FLOW STUDIES OF MAGNETICALLY INSULATED LINES
D. H. McDaniel, J. W. Poukey, K. D. Bergeron, J. P. VanDevender, and D. L. Johnson 1977 10 p refs Presented at the 2d Intern. Topical Conf., Ithaca, N. Y., 3 Oct. 1977
(Contract EY-76-C-04-0789)
(SAND-77-1365C; Conf-771035-3) Avail: NTIS HC A02/MF A01

A triplate vacuum line configuration eases many mechanical support problems and allows more A-K gaps or feeds to be packaged around a given radius. Very large relativistic electron beam accelerators, experiments using this type of vacuum transmission line, were conducted on the MITE (magnetically insulated transmission experiment) accelerator to obtain input impedance of the transmission line as a function of voltage and to measure electron loss currents. These measurements are compared to theoretical models for the input impedance and energy losses. The water pulse forming lines are connected to a vacuum triplate line through a conventional stacked insulator. Diagnostics on the experiment consisted of: (1) input V; (2) input I; (3) I monitors at the input, middle, and output of both the center conductor and ground plane of the transmission line; (4) magnetic energy analyzer to view peak electron energy in the A-K gap; (5) calorimetry; and (6) Faraday cups to look at electron current flow.
ERA

N78-20945# Sandia Labs., Albuquerque, N. Mex.
SUPER POWER GENERATORS
T. H. Martin, D. L. Johnson, and D. H. McDaniel 1977 24 p refs Presented at the 2d Intern. Topical Conf., Ithaca, N. Y., 3 Oct. 1977
(Contract EY-76-C-04-0789)
(SAND-77-1324C; Conf-771035-5) Avail: NTIS HC A02/MF A01

A power generator, operated with an 80 ns, 50 ns, 35 ns, and 20 ns positive output pulse high voltage mode is described and achieved total current rates of rise of 4 x 10 to the 14th power A/s. The two sided disk accelerator concept using two diodes achieved voltages of 1.5 MV and currents of 4.5 MA providing a power exceeding 6 TW in the electron beam and 8 TW in the transmission lines. A test bed named MITE (Magnetically Insulated Transmission Experiment) was designed and tested. The pulse forming lines are back to back short pulse Blumleins which use untriggered water switching. Output data showing a ten ns half width power pulse peaking above one terrawatt were obtained. MITE is a module being investigated for use in the electron beam fusion accelerator and will be used to test the effects of short pulses propagating down vacuum transmission lines.
ERA

74 OPTICS

Includes light phenomena.

N78-20946*# Wentz (Frank J.) and Associates, San Francisco, Calif.
ESTIMATION OF THE SEA SURFACE'S TWO-SCALE BACKSCATTER PARAMETERS
Frank J. Wentz Mar. 1978 126 p refs
(Contract NAS1-14775)
(NASA-CR-145255) Avail: NTIS HC A07/MF A01 CSCL 20F

The relationship between the sea-surface normalized radar cross section and the friction velocity vector is determined using a parametric two-scale scattering model. The model parameters are found from a nonlinear maximum likelihood estimation. The estimation is based on aircraft scatterometer measurements and the sea-surface anemometer measurements collected during the JONSWAP '75 experiment. The estimates of the ten model parameters converge to realistic values that are in good agreement with the available oceanographic data. The rms discrepancy between the model and the cross section measurements is 0.7 db, which is the rms sum of a 0.3 db average measurement error and a 0.6 db modeling error.
Author

N78-20947*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
IMAGE DISSECTOR PHOTOCATHODE SOLAR DAMAGE TEST PROGRAM
R. A. Smith Oct. 1977 74 p refs
(Contract NAS9-15200)
(NASA-CR-151657; LEC-11304; Rept-77-EG-27) Avail: NTIS HC A04/MF A01 CSCL 20F

Image dissector sensors of the same type which will be used in the NASA shuttle star tracker were used in a series of tests directed towards obtaining solar radiation/time damage criteria. Data were evaluated to determine the predicted level of operability of the star tracker if tube damage became a reality. During the test series a technique for reducing the solar damage effect was conceived and verified. The damage concepts are outlined and the test methods and data obtained which were used for verification of the technique's feasibility are presented. The ability to operate an image dissector sensor with the solar image focussed on the photocathode by a fast optical lens under certain conditions is feasible and the elimination of a mechanical protection device is possible.
Author

N78-20948*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
OPTICAL AND HOLOGRAPHIC STORAGE PROPERTIES OF F3, Cu, AND Mg-DOPED LITHIUM NIOBATE
Marvin E. Beatty, III and Barry D. Meredith Mar. 1978 18 p refs
(NASA-TP-1144; L-11964) Avail: NTIS HC A02/MF A01 CSCL 20F

Several samples of iron, copper, and magnesium doped lithium niobate were tested to determine their storage properties which would be applicable to an optical data storage system and an integrated optics data preprocessor which makes use of holographic storage techniques. The parameters of interest were the diffraction efficiency, write power, write time, erase time, erase energy, and write sensitivity. Results of these parameters are presented. It was found that iron doped lithium niobate samples yielded the best results in all parameters except for a few percent higher diffraction efficiency in copper doped samples. The magnesium doped samples were extremely insensitive and are not recommended for use in holographic optical data storage and processing systems.
Author

N78-20949# GTE Sylvania, Inc., Needham Heights, Mass. Electronic Systems Group, Eastern Div.
A STUDY OF APPLICATION OF OPTICS TO C3 SYSTEMS. VOLUME 2: VISUAL DISPLAYS Final Report, 20 Apr. 1976 - 28 Feb. 1977
Vernon J. Fowler and Joel H. Harris Griffiss AFB, N. Y. RADC Nov. 1977 132 p refs
(Contract F19628-76-C-0204)

(AD-A050177; RADC-TR-77-393-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 20/6

This final report contains a description of the present state of the art of visual display media, with particular attention being directed toward techniques involving Cathode-Ray Tubes (direct viewing and projection), Projection Light Valves, Projection Lasers, Plasma Panels, Liquid Crystals, and Electroluminescent Devices. These descriptions include a discussion of the background and history of each technique, the method of operation, the identification of areas requiring further research and development (including material problems), and a catalog of companies and list of experts currently active in the respective fields, as reflected in the extensive list of references. Following these descriptions; conclusions are made regarding the value of the various display techniques to C3 applications involving the optical presentation of alphanumeric and graphic information.

Author (GRA)

N78-20950# Defence Research Establishment Valcartier (Quebec).

USE OF SPATIAL FILTERING TO MATCH WIDE DYNAMIC RANGE GRAYSCALE IMAGERY TO A LOWER RESOLUTION DISPLAY

J. F. Boulter Jan. 1977 51 p refs In ENGLISH; FRENCH summary

(AD-A037846; DREV-R-4074/77) Avail: NTIS HC A04/MF A01 CSCL 20/6

We investigated the ability of nonlinear spatial filtering to reduce the amount of information that is lost when a display device has a lower dynamic range than the grayscale imagery to be displayed on it. Dynamic range compression can be achieved by attenuating an assumed low-frequency multiplicative background and enhancing higher frequencies using homomorphic filtering. This technique, originally described by Oppenheim for images formed by reflection of visible light, is extended to images formed by emission of IR radiation and transmission of X-ray and gamma-ray radiation. Examples are given which show dynamic range compression of the three types of images achieved by means of a homomorphic filtering and display procedure having no free parameters which must be optimized to suit the particular input image. Author (GRA)

N78-20951# Defence Research Establishment Valcartier (Quebec).

DIGITAL AREA CORRELATION TRACKING BY SEQUENTIAL SIMILARITY DETECTION

C. Munteanu Nov. 1977 51 p refs In ENGLISH; FRENCH summary

(AD-A047712; DREV-R-4097/77) Avail: NTIS HC A04/MF A01 CSCL 17/8

Area correlation tracking is an effective method of tracking targets that do not have salient characteristics. This involves detecting a target within a scene by means of its similarity with a stored image of the target. This report presents an evaluation of the performance of a sequential similarity detection algorithm (SSDA) in the task of digital image detection. It is shown that the performance of the SSDA is highly competitive with that of the widely used mathematical correlation method. Both techniques are reviewed and tested on still photographs. An analytical evaluation of the SSDA applied to binary images is presented. Author (GRA)

N78-20952# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

ABSOLUTE TWO-PHOTON ABSORPTION COEFFICIENTS IN ULTRA VIOLET WINDOW MATERIALS Final Technical Report, 1 Jun. 1975 - 30 Sep. 1977

N. Bloembergen and J. Blake Dec. 1977 47 p refs

(Contract F44620-75-C-0088; ARPA Order 2983)

(AD-A050379; AFOSR-78-0051TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The absolute two-photon absorption coefficients of U.V. transmitting materials have been measured using well-calibrated single picosecond pulses, at the third and fourth harmonic of a mode locked Nd:YAG laser systems. Two-photon absorption coefficients of the order of .001 cm/MW were measured for alkali-halides, and .0001 cm/MW for harmonic generating crystals. In materials with band gap greater than 2 h-bar omega, no nonlinear absorption could be observed. Calculations based on the Keldysh theory with one adjustable parameter agree quite well with the experimentally observed dispersions in the two-photon absorption coefficients. The effect of multi-photon absorption on the conversion efficiency of harmonic generating crystals and on the breakdown of U.V. window materials is also discussed. Author (GRA)

N78-20953# SRI International Corp., Menlo Park, Calif.

TECHNIQUES FOR THE MICROFABRICATION OF INTEGRATED OPTICAL WAVEGUIDE COUPLERS Final Report. 14 Apr. 1976 - 13 Jan. 1977

Eugene R. Westerberg and Ivor Brodie Jan. 1978 37 p refs (Contract N00173-76-C-0174)

(AD-A050464) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report covers the development of techniques for the microfabrication of integrated optical waveguide couplers. In particular an Electron Projection Exposure System (EPES), that uses a large-area electron beam to image an object transmission mask with a size reduction of a factor of twenty, was studied in detail. Techniques for fabricating transmission masks for EPES were successfully developed. Additional features were added to the original SRI electron optical column to make it applicable for IO device lithography, including mask alignment fixtures, a sample stage with external positioning drivers with a precision of 1000 A, and an electron projection lens with a resolution of 0.5 microns and an edge sharpness of 500 A. However, the problem of uniformly illuminating the object transmission mask with electrons proved to be extremely difficult to resolve, and for this reason the fabrication of a complete optical waveguide coupler using the EPES technique was not attempted. Techniques for indiffusing titanium strips on a lithium niobate substrate to obtain planar guides were developed, and attempts were made to produce devices using optical contact lithography and a high resolution mask supplied from an external vendor via NRL.

Author (GRA)

N78-20954# Mississippi State Univ., Mississippi State. Engineering and Industrial Research Station.

SOLID STATE IMAGING DEVICE PARAMETER STUDY FOR USE IN ELECTRO-OPTIC TRACKING SYSTEMS Final Report, 1 May 1976 - 31 Aug. 1977

Jerry W. Rogers and Wilson E. Taylor Oct. 1977 136 p refs (Grant AF-AFOSR-3022-76; AF Proj. 2305)

(AD-A049956; MSSU-EIRS-78/2; AFOSR-78-0064TR) Avail: NTIS HC A07/MF A01 CSCL 17/8

The introduction of the solid-state imaging device provides a new concept in sensor types which may be utilized in target trackers. Solid-state imagers do not require the high voltage technology used in conventional vidicons. Also, the possibility of on-chip signal processing of the video information makes the device very attractive in the area of scene evaluation. However, the devices actually provide a sampled image and have certain characteristics which limit their utilization as trackers or target acquisition sensors. The purpose of this study is three-fold. The first part consists of evaluating five existing trackers which utilize solid-state imagers as sensors. These imagers are of three types: charge-coupled devices (CCDs), charge injection devices (CIDs), and photodiode arrays. These trackers are investigated as the contrast, irradiance, and target velocity are varied on the image plane. Since the charge-coupled device shows great potential in this area, the next portion of the study is devoted to the evaluation of the CCD as a sensor in a tracking or target acquisition algorithm. Parameters are varied in a CCD simulation scheme to provide characteristics for the device. Contrast, target pattern signature, transfer efficiency, and grey level element tolerances can be varied for the simulation. The simulation provides a 100 x 100 element three-phase interline transfer device. GRA

N78-20955# Lincoln Lab., Mass. Inst. of Tech., Lexington.

GEODSS ETS COMPUTER/HARDWARE CONFIGURATION

Lawrie E. Eaton 28 Nov. 1977 19 p

(Contract F19628-78-C-0002)

(AD-A049686; ETS-26; ESD-TR-77-298) Avail: NTIS HC A02/MF A01 CSCL 20/6

The GEODSS Experimental Test Site at White Sands, New Mexico is operating in the duplex mode now that the second

telescope is on-line. The configuration of the two MODCOMP IV computers and peripherals is basic to the operation of two consoles and two telescopes. The report gives technical information on the computers and peripherals to explain how the direct memory processor interfaces external devices directly to memory.
Author (GRA)

N78-20956# Lincoln Lab., Mass. Inst. of Tech., Lexington.
TELESCOPE B USERS' GUIDE
Lawrie E. Eaton 28 Nov. 1977 31 p
(Contract F19628-78-C-0002)
(AD-A049685; ETS-22; ESD-TR-77-297) Avail: NTIS HC A03/MF A01 CSCL 20/6

The second 31 in. telescope is operating at the GEODSS Experimental Test System, White Sands, New Mexico. The improvements over the first telescope mount include a single DC drive servo per axis, and a microprocessor control system. The report describes the operating procedures for console/telescope control. Author (GRA)

N78-20957# Texas Univ., Austin. Applied Research Labs.
DIFFRACTION OF A PLANE N WAVE OF FINITE AMPLITUDE BY A SLIT M.S. Thesis. Interim Technical Report, 31 Oct. 1976 - 1 Nov. 1977
Wesley N. Cobb Aug. 1977 110 p refs
(Contracts F44620-76-C-0040; N00014-75-C-0867)
(AD-A050410; ARL-TR-77-43; AFOSR-78-0149TR) Avail: NTIS HC A06/MF A01 CSCL 20/6

A theoretical and experimental study of the diffraction of a plane N wave of finite amplitude by a slit is presented. The N waves used in the experiment were produced by an electric spark, which was located at the focus of a parabolic dish. The plane wave was normally incident on a 2.38 cm wide slit in a rigid baffle. Peak pressures at the slit of 99 mbar, 47 mbar, and 29 mbar were used. The corresponding time durations were 74, 34, and 25 microseconds. The spatial and temporal properties were obtained from schlieren and microphone measurements, respectively. A linear theory for slit diffraction was found from a time domain version of the Green's function solution. GRA

N78-20958# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
TECHNOLOGY AND PHYSICS OF INFRARED AND POINT CONTACT DIODES Final Report, 1 May 1974 - 31 May 1977
Ali Javan Griffiss AFB, N.Y. RADC Oct. 1977 95 p refs
(Contract F19628-74-C-0182; ARPA Order 2618)
(AD-A050176; RADC-TR-77-348) Avail: NTIS HC A05/MF A01 CSCL 09/1

Preliminary work in this laboratory has shown that tunneling characteristics of metal-oxide-metal junctions are essentially independent of frequency as long as photon energy is less than the barrier height. Recent calculations show the effects of circuit parameters on response of antenna/diode combinations; the junction capacitance is responsible for roll off in the infrared. Capacitance reduction requires shrinking junction size, hence the need for micron and submicron geometries. Photo emission (over the barrier rather than tunneling) and thermal effects dominate the response in the visible region. It seems likely that photoemission is a fast effect and can be used for visible mixing. Calculation of operating parameters for an infrared antenna/diode combination has been completed. This shows the performance of the receiving and detecting elements as a function of geometry and dielectric constants; included is the effect of the strong frequency dependence of the circuit elements. This work will be prepared for publication. Additional measurements have been made of the antenna pattern of a printed antenna/diode. An unsuccessful search was conducted for negative resistance in a fine tungsten point on gold. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N78-20959*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEMPERATURE DISTRIBUTIONS OF A CESIUM-SEEDED HYDROGEN-OXYGEN SUPERSONIC FREE JET
Shih-Ying Wang and J. Marlin Smith Feb. 1978 24 p refs
(NASA-TP-1162; E-9267) Avail: NTIS HC A02/MF A01 CSCL 20I

The hydrogen-oxygen plasma was generated at combustion chamber pressures ranging from 0.5 to 2.0 megapascals and for various seed ratios (1 to 10 percent). The plasma was observed as the atmospheric exhaust from a Mach 2 rocket test facility. Transverse profiles of the absolute integrated intensity were measured with the optically thin CsI lines (0.5664 and 0.5636 microns) at a range of axial positions downstream of the 5-cm-diameter combustor nozzle exit. Radial profiles of the emission coefficient were obtained from the measured transverse profiles of intensity by Abel inversion. Temperatures were then determined from the emission coefficients for conditions of local thermodynamic equilibrium using particle densities generated by a two-dimensional free jet computer program. Temperature results show the inherent effects of compression and expansion pressure waves characteristic of a free jet exiting from a supersonic nozzle. Author

N78-20960 Academy of Sciences (USSR), Moscow.
RELATIVISTIC MODES OF TEARING INSTABILITY IN A BACKGROUND PLASMA
L. M. Zelenyy and V. V. Krasnoselskikh 1977 32 p refs In RUSSIAN; ENGLISH summary
(Pr-381) Copyright. Avail: Issuing Activity

The influence of particle relativism and uniform immovable plasma background on the development of instability in collisionless plasma is discussed for the resonant tearing mode, related to the Landau damping and for the inertial kinetic tearing mode into which the first mode transforms if particle movement in the transition layer is magnetized by the magnetic field along the equilibrium- current direction. The presence of the background plasma (especially of a cold one) strongly suppresses the development of tearing instabilities as soon as its density exceeds the critical value, derived in the paper. Some nonlinear estimates of magnetic islands width are given. The processes of spontaneous merging related to the instabilities considered may play a crucial role in releasing magnetic energy in various astrophysical systems. Author

N78-20961# Ben Gurion Univ. of the Negev, Beersheva (Israel).
SUPERSONIC, NONEQUILIBRIUM CORNER-EXPANSION FLOW OF IONIZED ARGON
O. Igra and M. Barcessat May 1976 166 p refs
(Rept-8/76) Avail: NTIS HC A08/MF A01

The nonequilibrium corner-expansion flow field of a partially-ionized argon gas was solved numerically using the method of characteristics. The solution assumed a steady, two-dimensional and inviscid field. Throughout the expansion field, the electron temperature was found to be higher than that of the heavy particles. The temperature changes exhibited by the heavy particles along streamlines and along characteristics originating at the corner are very much similar to those reported in another study whose solution was based on the assumption of thermal equilibrium. Fair agreement was found between the present numerical solution and the experimental findings regarding the density and the degree of ionization changes along streamlines. Consequently, the present technique can be used with confidence for various plasma flows. The computer program used to solve the expansion field for two different corners (-5 deg and -15 deg expansion angle) when both had the same pre-corner conditions is included. Author

N78-20962# Michigan Univ., Ann Arbor.
SPACE INTERACTION STUDY Final Report, 1 Oct. 1976 - 1 Oct. 1977
Uri Samir Oct. 1977 13 p refs
(Contract F19628-77-C-0006)
(AD-A050171; AFGL-TR-77-0243) Avail: NTIS HC A02/MF A01 CSCL 22/2

A preliminary examination was conducted with the objective of evaluating some in-situ measurements obtained from the S3-2

and S3-3 Satellite for the study of the interaction between an ionospheric satellite and its environmental spaceplasma. Specifically, we refer to the measurements of ion currents, electron density and temperature, ionic composition, space potential and electric fields, and examine their use for the study of the angular distribution of ions around the satellites. GRA

N78-20963# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.
EVOLUTION OF PARAMETRICALLY EXCITED INSTABILITIES IN A MAGNETO-PLASMA COLUMN Interim Report, Apr. 1974 - Jun. 1977
Tso Q. Yip and Bernard R.-S. Cheo Jun. 1977 109 p refs
(Grant AF-AFOSR-2668-74)
(AD-A050388; POLY-EE/EP-77-028; AFOSR-78-0188TR)
Avail: NTIS HC A06/MF A01 CSCL 20/9

Experiments on parametric decay instabilities have been conducted in a hollow cathode arc generated plasma in a static magnetic field. A phenomenological model is used to describe the observed phenomena, and to determine the decay rate at various power levels, the linear and non-linear damping terms. An accurate estimate of the threshold power level is also obtained. And with the pump power switched from the fixed level to another, also above the threshold, the growth of the waves is also studied. The linear dependence of the decay and growth rate γ on power is clearly demonstrated, and the experimental values are compared to theoretically calculated ones to obtain the physical picture. The natural or linear damping of the electrostatic ion cyclotron wave is found to be due to ion-neutral collision. The non-linear damping term which yields information on the saturation mechanisms of the wave, is found to be proportional to the square of the amplitude. GRA

N78-20964# Los Alamos Scientific Lab., N. Mex.
CROSS-SECTION SENSITIVITY ANALYSES FOR A TOKAMAK EXPERIMENTAL POWER REACTOR
E. L. Simmons, S. A. W. Gerstl, and D. J. Duziak Sep. 1977 80 p refs
(Contract W-7405-eng-36)
(LA-6942-MS) Avail: NTIS HC A05/MF A01

The sensitivity of neutronic responses was determined in the preliminary design of the Tokamak Experimental Power Reactor and the use of a neutron gamma coupled cross section set was developed in the calculation of cross section sensitivity analysis. Response functions such as neutron plus gamma kerma, Mylar dose, copper transmutation, copper dpa, and activation of the toroidal field coil dewar were investigated. Calculations revealed that the responses were most sensitive to the high energy group cross sections of iron in the innermost regions containing stainless steel. For example, both the neutron heating of the toroidal field coil and the activation of the toroidal field coil dewar show an integral sensitivity of about -5 with respect to the iron total cross sections. Major contributors are the scattering cross sections of iron, with -2.7 and -4.4 for neutron heating and activation, respectively. The effects of changes in gamma cross sections were generally an order of 10 lower. ERA

N78-20965# California Univ., Berkeley. Dept. of Physics.
STOCHASTIC ACCELERATION BY A SINGLE WAVE IN A MAGNETIZED PLASMA Ph.D. Thesis
Gary Richard Smith 22 Sep. 1977 242 p refs
(Contract W-7405-eng-48)
(LBL-6824) Avail: NTIS HC A11/MF A01

An electrostatic wave propagating obliquely to the magnetic field causes stochastic motion if the wave amplitude exceeds a certain threshold. The overlap of cyclotron resonances then destroys a constant of the motion, allowing strong particle acceleration. The stochastic motion resembles a diffusion process even though the wave spectrum contains only a single wave. The motion of ions in a nonuniform magnetic field and a single electrostatic wave is treated in the study of a possible saturation mechanism of the dissipative trapped ion instability in a Tokamak. A theory involving the overlap of bounce resonances predicts the main features found in the numerical integration of the equations of motion. Ions in a layer near the trapped circulating boundary move stochastically. ERA

N78-20966# Sandia Labs., Albuquerque, N. Mex.
DETERMINATION OF ELECTRON BEAM CHARACTERISTICS IN STRONG PINCHES
T. P. Wright and G. R. Hadley Mar. 1977 12 p refs
(Contract EY-76-C-04-0789)
(SAND-77-0496) Avail: NTIS HC A02/MF A01

Radial profiles of electron beam fluid velocity, density, and temperature at the anode plane pinch region were presented. Beam characteristics were obtained from comparison of empirical and code results. The identification of the radially converging nature of the beam in the pinch region implies that smaller, hotter pinches should be attainable. This result was desirable for attaining power densities interesting for inertial fusion applications. ERA

N78-20967# California Univ., Livermore. Lawrence Livermore Lab.
ELECTROSTATIC BOUNCE MODES IN MIRROR PLASMAS
W. M. Sharp 3 Mar. 1977 120 p refs
(Contract W-7405-eng-48)
(UCRL-52185) Avail: NTIS HC A06/MF A01

Electrostatic bounce modes are standing waves that occur in a mirror plasma when the relative spread in electron bounce frequencies is small. The modes can be destabilized by an ion distribution with a peaked perpendicular energy, and experimental data suggest that this mechanism was the principal cause of instability in certain low density mirror experiments. After a review of theoretical work on electrostatic waves in mirror plasmas, a general matrix eigenvalue equation for the wave potential was derived which accounts accurately for electron histories and which includes the ion response. A computer program for calculating the plasma eigenmodes and the associated threshold densities for instability and maximum growth rates is described. The threshold densities for unstable bounce modes expected in the Baseball 1 and Baseball 2 devices are compared with experimental values. ERA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N78-20968 Ohio State Univ., Columbus.
SINGLE CRYSTAL ELECTRON SPIN RESONANCE STUDIES OF SPIN-LABELED ALPHA-CHYMOTRYPSIN CRYSTALS Ph.D. Thesis
Roger Stephen Bauer 1977 240 p
Avail: Univ. Microfilms Order No. 77-31823

Single crystals of the serine protease, alpha-chymotrypsin, were spin-labeled with nitroxide free radicals and then examined by electron spin resonance (ESR). Three different types of spin labels were employed: (1) spin label esters, which are substrate analogs, (2) sulfonyl fluoride labels, which are specific inhibitors of chymotrypsin activity; and (3) a noncovalent spin label derivative of the inhibitor indole. Orientation effects were observed with both enantiomers of the spin label ester 3-carboxy-2,2,5,5-tetramethyl pyrrolidinyl-1-oxyl p-nitrophenyl ester and with the spin label derivative of indole. The ESR spectra of chymotrypsin crystals crosslinked with 0.5 percent glutaraldehyde for 12-16 hours before and after spin-labeling with S-3-carboxy-2,2,5,5,-tetramethyl pyrrolidinyl -1- oxyl p-nitrophenol ester is analyzed. Dissert. Abstr.

N78-20969 California Univ., Berkeley.
STUDIES OF THE SURFACE STRUCTURES OF MOLECULAR CRYSTALS AND OF ADSORBED MONOLAYERS ON THE (111) CRYSTAL FACES OF PLATINUM AND SILVER BY LOW-ENERGY ELECTRON DIFFRACTION Ph.D. Thesis
Lawrence Edward Firment 1977 430 p
Avail: Univ. Microfilms Order No. 77-31352

The structures of molecular crystal surfaces have been investigated using Low-Energy Electron Diffraction (LEED). The experimental results from a variety of molecular crystals were examined and compared as a first step towards understanding

the properties of these surfaces on a microscopic level. The method of sample preparation employed, vapor deposition onto metal single crystal substrates at low temperatures in ultra-high vacuum, allowed concurrent study of the structures of adsorbed monolayers on metal surfaces and of the growth processes of molecular films on metal substrates. The systems investigated were ice, ammonia, naphthalene, benzene, the n-paraffins (C3-C8), cyclohexane, trioxane, acetic acid, propionic acid, methanol and methylamine adsorbed and condensed on both Pt(111) and Ag(111) surfaces. Dissert. Abstr.

N78-20970 Oregon State Univ., Corvallis.
MOLECULAR INTENSITY PARAMETERS IN THE SOLID STATE Ph.D. Thesis
Larry Richard Fredrickson 1977 130 p
Avail: Univ. Microfilms Order No. 77-29412

Oblique incidence infrared reflection spectra were obtained for single crystal beta NaN3 and were then fitted to a harmonic oscillator model of the dielectric function. From this fitting, transverse frequencies, oscillator strengths and phenomenological damping parameters are obtained and used to calculate dipole moment and bond moment derivatives. These parameters are then incorporated into a charge flux description of molecular vibrations. A local field description of nonlinear contributions to the Raman scattering tensor is developed, which relates relative transverse-longitudinal Raman line strengths to the absolute Raman intensity. Raman spectra were obtained for NH4Cl(iv) and ND4Cl(iv) using polarization techniques to obtain data for intensity calculations and to elucidate certain two phonon bands. Dissert. Abstr.

N78-20971 California Univ., Berkeley.
THE INDICATRIX OF COMPOSITE CRYSTALS, 1. CALCULATION OF THE INDICATRIX OF SILICATE MINERALS WITH THE CLASSICAL POINT-DIPOLE MODEL, 2. THE STRUCTURE OF TWO SODIUM-URANYL FLUORIDES, 3. Ph.D. Thesis
James Robert Hauser 1977 191 p
Avail: Univ. Microfilms Order No. 77-31389

A model based on the volume average of the dielectric tensor is derived and applied to calculate the geometric optical properties of several composite systems, including calcite and alkali feldspars. A version of the point-dipole model of the electric polarization is developed and applied to calculate the geometric optical properties of several silicate minerals. The crystal structure was analyzed for two sodium-uranyl double fluorides, Na3(UO2) 2F7(nH2O) with n = 2 and n = 6. The uranium ion in both structures has seven-fold coordination with the two uranyl oxygen atoms forming the equator of a pentagonal bipyramid. The salts are shown to be members of a series of uranyl salts which share this structural feature. Dissert. Abstr.

N78-20972 Pennsylvania Univ., Philadelphia.
NONEQUILIBRIUM QUASIPARTICLE AND PHONON DYNAMICS IN SUPERCONDUCTORS Ph.D. Thesis
Steven Barry Kaplan 1977 188 p
Avail: Univ. Microfilms Order No. 7730212

A theoretical treatment of the lifetimes of quasiparticles and phonons in low-energy states for a variety of superconductors in the dirty limit were obtained using tunneling and neutron scattering data. Implications bearing on nonequilibrium phenomena are shown to be important in the two experimental studies discussed. A short discussion of the acoustic coupling of thin superconducting films prefaces an explanation of how a project designed to study this problem led to the discovery of a previously undetected effect: an inhomogeneous excess quasiparticle density in a photoexcited superconducting tunnel junction. Preliminary results of another study using the double-junction geometry are given in which direct experimental information on the form of the steady-state quasiparticle energy distribution is obtained for the first time. Dissert. Abstr.

N78-20973 California Univ., Berkeley.
DEVELOPMENT AND APPLICATIONS OF THE TUNNEL JUNCTION dc SQUID Ph.D. Thesis
Mark B. Ketchen 1977 197 p
Avail: Univ. Microfilms Order No. 7731422

A cylindrical dc superconducting quantum interference detector (SQUID) with shunted Nb-NbOx-Pb Josephson tunnel junctions was developed, as well as a planar SQUID of related design, which does not ideally respond to a uniform applied magnetic field. The operation of planar thin-film gradiometers of two sizes having the SQUID symmetrically located on the Nb strip is discussed. The incorporation of a cylindrical dc SQUID into a voltmeter circuit to measure thermal fluctuations in tin fibers is described. Dissert. Abstr.

N78-20974 California Univ., Berkeley.
DEFECTS, PHASE TRANSFORMATIONS AND MAGNETIC PROPERTIES OF LITHIUM FERRITE Ph.D. Thesis
Raja Kishore Mishra 1977 121 p
Avail: Univ. Microfilms Order No. 77-31466

Achieving suitable magnetic properties in ceramic ferrites through thermomechanical treatments rather than through varying the processing and fabrication parameters alone was investigated. The kinetics and crystallography of the solid state phase transition accompanying oxygen and lithium loss in LiFe5O8 was studied at 1200 C in air, oxygen and vacuum using high voltage electron microscopy. LiFeO2 was observed to nucleate and grow in the LiFe5O8 matrix and finally transform to spinel in all three atmospheres; but the kinetics of the transformation depend on atmosphere. Structural defects in as-prepared and deformed lithium ferrite spinel were studied using transmission electron microscopy. The surface topography accompanying the material loss is characterized. Magnetic property measurements showed that a dispersion of paramagnetic LiFeO2 particles in LiFe5O8 matrix gives rise to increased squareness of the hysteresis curve, increased coercivity and a higher electrical resistivity. Dissert. Abstr.

N78-20975 Oklahoma State Univ., Stillwater.
ELECTRONIC STRUCTURE OF DEFECTS IN SOME OXIDES Ph.D. Thesis
Jeanette M. Feldott 1977 218 p
Avail: Univ. Microfilms Order No. 7801243

The atomic structure of F-type defects in SrO and CaO was investigated using the spectral response and temperature dependence of dc-photoconductivity with associated optical absorption, luminescence and fluorescence lifetime measurements. Trapping mechanisms in the crystal are also investigated. The f(+)-center was introduced into SrO by proton or neutron irradiation. Electron irradiation was much less efficient in producing F(+)-centers in SrO and the F-center could not be introduced into SrO by particle irradiation. Proton and neutron irradiation of CaO produced predominantly F(+)-centers as did also our electron irradiations. Particle irradiation with electrons, protons and neutrons also produced F-centers in CaO. Measurements were made principally on samples irradiated at temperatures down to 77 K with 1.5 MeV electrons or protons. Dissert. Abstr.

N78-20976 Alabama Univ., University.
LATTICE DEFECTS IN STRONTIUM OXIDE Ph.D. Thesis
Ivan Alexander Brezovich 1977 109 p
Avail: Univ. Microfilms Order No. 78-00620

The sodium related F sub A center lattice defect in strontium oxide consists of an electron trapped at an oxygen ion vacancy next to Na(+) replacing one of the nearest Sr(++) neighbors of the oxygen ion vacancy. The electron paramagnetic resonance (EPR) spectra, taken at 77 K after gamma-irradiation, show two sets of four well resolved hyperfine lines. Electron nuclear double resonance (ENDOR) measurements confirmed that the hyperfine splitting was due to the 100% naturally abundant Na-23 isotope with nuclear spin of 3/2. The EPR spectrum exhibits [100] axial symmetry and can be described by a spin Hamiltonian. A simple EPR spectrometer, employing an electronic microwave chopper for frequency translation, is also reported. The sensitivity of the spectrometer is comparable to that of a superheterodyne system. Dissert. Abstr.

N78-20977 Lehigh Univ., Bethlehem, Pa.
A STUDY OF INTERGRANULAR FRACTURE OF MOLYBDENUM BICRYSTALS Ph.D. Thesis
Fang-Loong Cheng 1977 141 p
Avail: Univ. Microfilms Order No. 7800833

The effects of grain boundary structure of molybdenum bicrystals on the boundary cohesive strength, fracture mode

transition, boundary segregation, and precipitation morphology were investigated to gain a better understanding of embrittlement and intergranular fracture in b.c.c. metals. Molybdenum bicrystals of simple tilt and simple twist boundaries with rotating axes along the (100) and the (110) directions were prepared in a vacuum zone melter. The misorientation angle of the bicrystals ranges from 0 deg to about 50 deg or more, with an interval of about 8 deg to 10 deg. Observations by Auger and scanning electron microscopy were used as the basis for a model which assumes that the weakening of molybdenum grain boundaries is caused by the segregation of interstitials such as carbon.

Dissert. Abstr.

N78-20978# Delaware Univ., Newark. Dept. of Chemistry.
LATTICE DYNAMICS OF HEATED NITRAMINES Annual Report
Thomas B. Brill Nov. 1977 49 p refs
(Grant AF-AFOSR-3055-76)
(AD-A050382; AFOSR-78-0167TR) Avail: NTIS HC A03/MF A01 CSCL 19/1

The laser Raman spectra of the four known polymorphs of octahydro-1, 3, 7-tetranitro-1,3,5,7-tetrazocine (HMX) have been recorded. Comparison of the spectra show that beta-HMX contains a different ring conformation than do alpha, gamma, and delta-HMX. Alpha, gamma, and delta-HMX have conformations which are similar to one another. The phase transition behavior between the polymorph forms was studied at slow heating rates. Gamma-HMX appears to contain more anharmonicity in its vibrational motions and this may explain why it does not form thermally from the other polymorphs, but readily converts to delta-HMX upon heating. Research on RDX heating rates and polymorphs has been undertaken, recently, along with spectral examination of the decomposition products of HMX.

Author

N78-20979# Crystal Systems, Inc., Salem, Mass.
SCALE-UP OF THE HEAT EXCHANGER METHOD TO GROW 14.5 INCH DIAMETER SAPPHIRE BOULE FOR IR DOME Final Report, 15 May 1976 - Apr. 1977
Frederick Schmid Wright-Patterson AFB, Ohio AFML May 1977 26 p refs
(Contract F33615-76-C-5257; AF Proj. 1155)
(AD-A050325; AFML-TR-77-92) Avail: NTIS HC A03/MF A01 CSCL 22/2

Sapphire crystals 14-1/2-inch diameter were successfully solidified out to the crucible, but the crystals were cracked. The heat flow conditions were sufficient to maintain and drive a planar solidification front. This was surprising, since the crucible was less than 1-1/2 inches from the heating element at its closest point. Cracking in all runs occurred due to a breakdown of crystallinity. One grain was nucleated a short distance from the seed in the first two boules. The breakdown in crystallinity near the seed appears to be related to sagging of the crucible. Cracking, the only problem, was due to breakdown in crystallinity. This was traced to the sagging of the crucible causing uneven temperature distribution along the bottom. Author (GRA)

N78-20980# California Inst. of Tech., Pasadena. Dept. of Electrical Engineering.
ANALYSIS OF SEMICONDUCTOR STRUCTURES BY NUCLEAR AND ELECTRICAL TECHNIQUES Interim Scientific Report
King N. Tu and James W. Mayer Jul. 1977 77 p refs
(Contract F19628-75-C-0008)
(AD-A050175; RADC-TR-77-254; SR-5) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report is an overview of the subject of silicide formation by thin metal films reacting with a Si substrate. The first section discusses the method of sample preparation typically used in the studies of silicide formation. Three specific cases are reviewed in detail (Ni, Hf, V). They fall in a general pattern of silicide formation (metal-rich silicides, monosilicides, disilicides). Oxidizing ambients during the annealing can interfere with the kinetics, but do not appear to affect the final composition of the compounds formed. The second section treats marker experiments of various kinds (implanted inert gas atoms, deposited inert metal islands, radioactively marked atoms and compound layers). The results of these experiments are discussed, and it is shown how atomic diffusivities can be derived from marker experiments. The third section deals with the formation process itself. The role of the solubilities and diffusivities of the elements in each other, and in the compounds, are discussed. The energy of formation of the silicides are compared with the types of silicides actually observed. It is noted that kinetics of atomic movements and the crystal structure of the compounds must be considered to come to an understanding of the silicides observed. A central question is that of nucleation and which phase the nucleation process will favor. GRA

N78-20981# California Inst. of Tech., Pasadena. Div. of Chemistry and Chemical Engineering.
HIGH-RESOLUTION, SOLID STATE NMR Interim Technical Report
Robert W. Vaughan Jan. 1978 56 p
(Contract N00014-75-C-0960)
(AD-A050145; TR-7) Avail: NTIS HC A04/MF A01 CSCL 20/12

A review of the experimental capabilities presently available for the modification of spin Hamiltonians normally encountered in solids has been presented to illustrate the control the still-developing high-resolution, solid state NMR techniques furnish. Examples have been discussed to furnish insight into how such schemes can be used to control the time development of a nuclear spin system to allow a detailed characterization of both the electronic and molecular-frame structure near a nuclear site. While the examples specifically discussed have been chosen from areas of current activity, they are only examples of present efforts, and future developments in this field will undoubtedly furnish many more such examples since the concepts upon which these techniques are based are quite general, and there exists great flexibility for the development of specific experimental schemes for a given problem. Author (GRA)

N78-20982# National Bureau of Standards, Washington, D. C. Inst. for Applied Technology.
CONTROL OF MOBILE-ION CONTAMINATION IN OXIDATION AMBIENTS FOR MOS DEVICE PROCESSING Final Report, Oct. 1976 - Oct. 1977
Santos Mayo, Richard Y. Koyama, and Thomas F. Leedy Jan. 1978 44 p refs
(Contract DNA-IACRO-77-809)
(AD-A049631; NBSIR-77-1404) Avail: NTIS HC A03/MF A01 CSCL 20/12

An alternative method for controlling the mobile-ion contamination in the oxidation ambients for MOS device processing is explored. Mobile-ion contamination in silicon dioxide films thermally grown in dry oxygen at 1000 C on silicon substrates has been studied by use of a double-wall fused-silica oxidation tube. The space between the tubes was alternately filled with chlorine, room air, or sodium hydroxide gas to determine if a correlation exists between the presence of these substances in the jacket and the mobile-ion density in the oxide films. MOS capacitors were prepared on these films and mobile-ion densities were measured using conventional c-v techniques. The ion densities ranged from 10 to the 13th power to 10 to the 10th power/sq cm as a function of the jacket atmosphere. These preliminary results suggest that there is a correlation between the presence of cleaning or contaminating agents in the jacket and the mobile-ion density in the oxide films. Both cleaning and contaminating actions occur through the tube wall.

Author (GRA)

N78-20983# Weapons Research Establishment, Salisbury (Australia).
THE EFFECT OF ION IRRADIATION ON THE INTRINSIC STRESS AND SUBSTRATE ADHESION OF GERMANIUM FILMS
E. H. Hirsch and I. K. Varga Aug. 1977 15 p refs
(AD-A048019; WRE-TR-1832(A)) Avail: NTIS HC A02/MF A01 CSCL 11/6

Irradiation with argon ions is shown to increase greatly the adhesion of vacuum evaporated Germanium films on glass and other substrates. The observations suggest that the effect is due to the penetration of Ge atoms into the substrate after collision with the energetic ions. In addition, the intrinsic stress of films deposited under ion bombardment is found to be

substantially lower than that of similar films, produced without simultaneous irradiation. Author (GRA)

N78-20984# Ames Lab., Iowa.
EFFECTS OF HYDROGEN ON THE SINGLE CRYSTALLINE ELASTIC CONSTANTS OF NIOBIUM M.S. Thesis
Daniel Michael Schlader Jun. 1977 42 p refs
(Contract W-7405-eng-82)
(IS-T-759) Avail: NTIS HC A03/MF A01

A special hydriding system was designed and constructed to satisfy conditions for hydriding niobium. This system controlled the temperature and hydrogen atmosphere surrounding the niobium while ultrasonic measurements were recorded. Ultrasonic wave velocities were determined by measurement of the times for ultrasonic pulses to transit and then echo through known dimensions of test specimens. The method which was employed is commonly known as the pulse-echo-overlap method. In this study the elastic constant C prime continued to decrease and the elastic constant C sub 44 continued to increase up to 4.69 atomic percent hydrogen which is the maximum concentration which has yet been examined. ERA

N78-20985# Brookhaven National Lab., Upton, N. Y.
ORIENTATIONAL EPITAXY IN ADSORBED MONOLAYERS
A. D. Anthony D. Novaco (Lafayette Coll., Easton, Pa.) and John P. McTague (Calif. Univ., Los Angeles) 1977 19 p refs Presented at the Two-Dimensional Absorbed Phases Conf., Marseille, France, 6 Sep. 1977
(Contract EY-76-C-02-0016; Grants NSF DMR-75-15630; NSF CHE-76-21293)
(BNL-22804; Conf-770905-1) Avail: NTIS HC A02/MF A01

The ground state for adsorbed monolayers on crystalline substrates was shown to involve a definite relative orientation of the substrate and adsorbate crystal axes, even when the relative lattice parameters were incommensurate. The rotation angle which defines the structure of the monolayer-substrate system is determined by the competition between adsorbate-substrate and adsorbate-adsorbate energy terms, and is generally not a symmetry angle. Numerical predictions are presented for the rare gas-graphite systems, whose interaction potentials are rather well known. Recent LEED data for some of these systems appear to corroborate these predictions. ERA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N78-20986 Case Western Reserve Univ., Cleveland, Ohio.
DYNAMICS OF SCIENTIFIC COMMUNICATION: AN APPLICATION TO SCIENCE FUNDING POLICY Ph.D. Thesis
Gilda Maria Braga 1977 118 p refs
Avail: Univ. Microfilms Order No. 77-30977

Some of the major problems associated with criteria for funding policies can be grouped into four categories, according to whether they refer to: (1) division of available funds among the different areas of science; (2) detection of oncoming crisis in a given area; (3) which scientists should be supported, within an area; and (4) which communication channels (journals) should be supported, also within an area. A model was devised, based on static and dynamic analyses of the literature. The results of the experiment show that the model is generalizable and can be used by science administrators as a help in establishing funding policies. Dissert. Abstr.

N78-20987 Northwestern Univ., Evanston, Ill.
DEVELOPMENT OF INFORMATION SYSTEMS ACTIVITIES AND INTERFACES TO SUPPORT TOP MANAGEMENT FUNCTIONS Ph.D. Thesis
Ronald J. Teichman 1977 449 p
Avail: Univ. Microfilms Order No. 77-32359

The general model of an advanced information system used as a point of departure is based on the current state of the art in information systems as applied in leading organizations. The research involved the applications of a system's design methodology to the identification and study of top management functions. Conceptual and empirical literature in the areas of business policy and organization theory was examined to specify and develop the advanced information system related requirements generated by these identified top management functions. By means of this study of the literature, the analysis began with an examination of the general environment within which top management must work and the nature of the issue resolution process which underlies all the decisional activities of top management. Dissert. Abstr.

N78-20988 Virginia Univ., Charlottesville.
A METHODOLOGY FOR MODELING A UNIVERSITY RESEARCH SUPPORT SERVICE SYSTEM Ph.D. Thesis
Seshagiri Rao Vemuri 1977 272 p
Avail: Univ. Microfilms Order No. 7800437

A framework was developed for examining a university research support service system by analyzing system performance in response to changes generated internally and/or externally to the system. The system effectiveness is measured in terms of net research time available to researchers, response time of research support services in providing services, and the contributions of these services to the indirect cost goal of the institution. The development of the basic model is carried out using the University of Virginia as an illustration. The analysis concerns system performance changes in response to procedural modifications in the institution, removal of external procedural constraints imposed by the government, and changes in organizational configuration. As an additional consideration, the simulation model is reinforced by relating its output to an independently developed overhead rate model. Dissert. Abstr.

N78-20989*# Operations Research, Inc., Silver Spring, Md.
ALTERNATIVE MANAGEMENT AND FUNDING OPTIONS FOR AERONAUTICS PROGRAMS, TASK 1
5 Mar. 1975 45 p refs
(Contract NAS5-24033)
(NASA-CR-156713) Avail: NTIS HC A03/MF A01 CSCL 05A

Research and technology will be at lower program levels with basic military research for aviation decreasing as fewer aircraft programs are initiated and the present new aircraft programs move into the prototype and production status. The key question is can industry take on the management and financing role and meet the criteria and characteristics considered essential for a viable research and technology program. The criteria for evaluating alternative approaches include an examination of the nature of the product to be provided, responsiveness to changing needs, efficiency in terms of costs, ability to provide leadership, and to provide impartial and independent evaluation

of approaches, and to provide technological inputs for regulating functions. Author

N78-20990*# Operations Research, Inc., Silver Spring, Md.
IDENTIFICATION AND PROMULGATION OF OBJECTIVES FOR OAST R AND T PROGRAMS, TASK 2
5 Mar. 1975 41 p ref
(Contract NAS5-24033)
(NASA-CR-156714) Avail: NTIS HC A03/MF A01 CSCL 05A

Overall perspectives and guidelines are discussed for defining and promulgating NASA's Office of Aeronautics and Space Technology (OAST) objectives to meet national needs and goals in aeronautical, space, and nuclear technology. Emphasis is placed on the practicality of ultimately instituting objective-setting processes within the normal OAST operation, and of establishing quantitative measures to be used as a working management tool in determining the degree to which the objectives have been or are being met. Author

N78-20991# Canyon Research Group, Inc., Westlake Village, Calif.
NEW METHODOLOGIES PROGRAM Final Scientific Report, 1 Sep. 1975 - 31 Oct. 1977
Charles W. Simon 31 Oct. 1977 15 p refs
(Contract F44620-76-C-0008)
(AD-A049346; AFOSR-78-0008TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

During this period, four reports were written and two reports written on earlier Advanced Methodologies Programs were revised. As a result of realizing the objectives of the program, it is now possible to study systematically the effects of 25, 50, or 100 variables deemed potentially critical to a particular task and to do so with considerable economy in the data collection effort while meeting all relevant scientific standards. No practical technique has ever been available before that would permit the experimenter to investigate problems of such complexity in such a systematic and economical manner. Author (GRA)

N78-20992# Naval Postgraduate School, Monterey, Calif.
A STUDY OF THE SYSTEM DEVELOPMENT PROCESS M.S. Thesis
Gabriel Oswaldo Flores Prado Dec. 1977 72 p refs
(AD-A050240) Avail: NTIS HC A04/MF A01 CSCL 05/2

Management information is of critical importance in modern decision making. The role of the computer in this process is rapidly expanding, creating challenging goals for data processing specialists and functional area specialists alike. A totally integrated computer based management information system (MIS) requires long term planning and design efforts coupled with detailed analysis of information system requirements. The MIS development generally follows a master plan; this master plan contains three major phases: MIS Analysis, MIS Design, and MIS Implementation. The different phases through which the master plan evolves are known as the system development process. This thesis describes the development of the master plan. Author (GRA)

N78-20993# Oak Ridge National Lab., Tenn.
DYNAMIC INTERACTIVE MANPOWER PLANNING AND ANALYSIS PROGRAM FOR A MATRIX ORGANIZATION
V. R. Bullington, R. G. Cardwell, and R. L. Stephenson Oct. 1977 26 p
(Contract W-7405-eng-26)
(ORNL-5276) Avail: NTIS HC A03/MF A01

A computerized manpower planning and analysis method used by a large complex research division with a matrix organization is explained. The example used is a research division consisting of 20 functional cost centers working on approximately 100 programs. The mathematical basis for the calculations and details of the computer program used in the system are described, and typical examples are displayed. ERA

N78-20994# General Accounting Office, Washington, D. C. Financial and General Management Studies Div.
NEED FOR ADDITIONAL INTERNAL AUDIT COVERAGE IN THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
27 Dec. 1977 23 p
(PB-275321/8; FGMSD-78-12) Avail: NTIS HC A02/MF A01 CSCL 05A

The NASA internal audit staff has been reduced by 50 percent since 1967, has been unable to adequately audit internal operations at Headquarters and several Field Centers and component installations. NASA's management needs to evaluate the audit function to determine what actions should be taken to strengthen the audit staff and provide effective audit coverage as required by the Accounting and Auditing Act of 1950. GRA

N78-20995# People, Access, Coastal Environment, San Francisco, Calif.
A CITIZEN'S GUIDE TO THE CALIFORNIA COASTAL ACT OF 1976
Tom Hofweber, Moe Staunezer, and Joan Jackson Aug. 1977 43 p Sponsored in part by Univ. of Southern California, Los Angeles
(Contract NOAA-04-6-158-44118)
(PB-275373/9; NOAA-77091205) Avail: NTIS HC A03/MF A01 CSCL 13B

The Coastal Act is summarized and the rationale behind granting the state and regional coastal commissions the authority to control development in the coastal zone by issuing permits, and to exclude areas and categories of development from the permit process is discussed. The permit process, local coastal programs, and the role of the public in these programs are described. GRA

N78-20996# Environmental Protection Agency, Washington, D. C. Water Planning Div.
WATER QUALITY MANAGEMENT ACCOMPLISHMENTS, COMPENDIUM 1
Dec. 1977 119 p
(PB-275631; EPA-440/3-77-026) Avail: NTIS HC A06/MF A01 CSCL 13B

The Water Quality Management Accomplishments, Compendium 1 includes 58 brief case studies that document programs and activities, developed through WQM planning efforts, which have significant potential for improving water quality. Cases are classified as either accomplishments or performance indicators. Accomplishments indicate programs which have been formally adopted and are being implemented. Performance indicators are WQM recommended programs which have received some preliminary commitment but have not reached the implementation stage. The cases are examples of successful efforts by WQM planning agencies to achieve implementation of outputs from the 208 programs. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N78-20997 Case Western Reserve Univ., Cleveland, Ohio.
ON THE DESIGN OF AN INFORMATION RETRIEVAL SYSTEM Ph.D. Thesis
Ovadia Mansur 1977 130 p
Avail: Univ. Microfilms Order No. 77-31002

The various elements of an information retrieval system are discussed and suggestions are made towards the design of a system more effective than the conventional operating systems (of the Boolean type). A time dependent model for quality assessment of the journal literature is suggested in order to filter out nonrelevant material. The retrieval strategy, a modified version of Goffman's indirect method, conveys the answer in the form of a map of ordered linked documents, in which the user finds his own optimal path. A time dependent model for combining several relevance indicators to be used as a measure of documents' relatedness was proposed. The experiment performed indicates that such a combination might increase effectiveness, i.e., augment relevance and decrease noise. Dissert. Abstr.

N78-20998 California Univ., Berkeley.
THE EFFECT OF DOCUMENT RANKING ON RETRIEVAL SYSTEM PERFORMANCE: A SEARCH FOR AN OPTIMAL RANKING RULE Ph.D. Thesis
Keith Henry Stirling 1977 136 p
Avail: Univ. Microfilms Order No. 7731557

An optimal document ranking rule developed through relevance feedback from systems users is contrasted with other document ranking algorithms. The ranking rule lays the basis for an optimal system and supplies a standard against which the effectiveness of other ranking procedures may be established. Ranking algorithms considered include the probability ranking rule, the optimal probabilistic strategy, and the optimal ranking rule. Dissert. Abstr.

N78-20999 Washington State Univ., Pullman.
A STRUCTURE FOR THE ORGANIZATION AND MAINTENANCE OF LARGE ORDERED DIRECTORIES Ph.D. Thesis
James Alma Larson 1977 101 p
Avail: Univ. Microfilms Order No. 78-00416

The technique uses a tree structured directory which can be easily implemented on electromagnetic storage media. Computers can be used to search this directory efficiently and provide the appropriate response quickly. A new class of search trees, C-trees, was defined. C-trees are a generalization of the B-tree file structure proposed by Bayer and McCreight. Two other important dynamic search tree structures were shown to be equivalent to subclasses of C-trees. Storage utilization, average tree depth, and average number of keys in each node were derived for C-tree structures resulting from a large number of deletions. A technique to compare various insertion strategies is presented. Transformations are described which may be applied locally to decrease the insertion cost. Dissert. Abstr.

N78-21000 Stanford Univ., Calif.
OPTIMIZING THE SEQUENTIAL ACQUISITION OF INFORMATION Ph.D. Thesis
Henry Adam Olender 1977 151 p
Avail: Univ. Microfilms Order No. 7802210

The maximum number of possibly worthwhile stages for each possible state through which a decision process may progress can be determined before applying the value iteration approach of dynamic programming. Although prior computation of the effective limited horizon of a given problem is not generally possible, an upper bound on the effective horizon can be determined and improved during various stages of the solution. The one-stage information acquisition problem and the state transition structure of the problem are analyzed in order to partition the state space into regions for which the upper bound on the number of possibly beneficial stages of information acquisition is known. After solving any subsequent stage of the problem, the state space can be repartitioned to improve these upper bounds. An algorithm was developed and employed to solve a bidding problem. Only three stages of solution were required to solve the problem for any number of available stages.
Dissert. Abstr.

N78-21001# Mechanical Properties Data Center, Traverse City, Mich.
[OPERATION, DEVELOPMENT, AND ACTIVITIES OF MECHANICAL PROPERTIES DATA CENTER] Annual Report, 16 Sep. 1975 - 15 Sep. 1977
Robert C. Braden Dec. 1977 37 p
(Contract DSA900-76-C-0861)
(AD-A050399; AMMRC-TR-78-3; AR-14) Avail: NTIS HC A03/MF A01 CSCL 05/2

This report reviews and discusses the continuing operation and development of the Mechanical Properties Data Center. Activity and growth of the Center are discussed in terms of the six major work areas: Input, File Maintenance, Output, Systems Development, Management and Marketing-Sales. Author (GRA)

N78-21002# Maryland Univ., College Park. Computer Science Center.
NONDETERMINISTIC BOTTOM-UP PYRAMID ACCEPTORS
Akira Nakamura and Charles R. Dyer Dec. 1977 14 p refs (Grant AF-AFOSR-3271-77)
(AD-A050466; TR-616; AFOSR-78-0176TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Several properties and capabilities of nondeterministic bottom-up pyramid cellular acceptors (NBPA's) are presented. NBPA's are a special case of the pyramid cellular acceptors. The main result is that the class of languages accepted by nondeterministic bounded cellular array acceptors is the same as that accepted by NBPA's. GRA

N78-21003# Ballistic Research Labs., Aberdeen Proving Ground, Md.
STORAGE AND RETRIEVAL OF INFORMATION ON SYSTEMS OF PARTIAL DIFFERENTIAL EQUATIONS AND THEIR SOLUTIONS: CREATABASE AND THE CONTINUUM/MECHANICS CENTER DATA BASE OF HYDROCODES
Morton A. Hirschberg, Joseph Lacetera, and James A. Schmitt Sep. 1977 47 p
(AD-A050307; BRL-2015) Avail: NTIS HC A03/MF A01 CSCL 09/2

A Continuum Mechanics Center has been established for the purposes of evaluating and developing models of interacting continua. Because of the large and growing body of literature concerning such models and related computer codes, the vast number of assumptions made in their use, and the varying types of numerical methods utilized in these codes, a data base analysis system, CREATABASE, was used to store information and characteristics of the different codes. This paper briefly describes CREATABASE, delineates the data base, describes queries made on the data base, and outlines future uses and expansion of the data base and the data base analysis system. Author (GRA)

N78-21004# Argonne National Lab., Ill.
SPEAKEASY-3 REFERENCE MANUAL. LEVEL MU. IBM OS/VS VERSION
Stanley Cohen and Steven C. Pieper Aug. 1977 345 p Revised
(Contract W-31-109-eng-38)
(ANL-8000-Rev-2) Avail: NTIS HC A15/MF A01

SPEAKEASY is a computer language designed to provide access to information stored in a computer. The language is based on the concepts of arrays and matrices, and processes these as entities; the need for many of the loops necessary in other programing languages is thus eliminated. It has a large vocabulary (over 500 words) of functions and commands in the areas of array manipulation, matrix algebra including eigenanalysis, special mathematical functions, numerical integration and differentiation, statistics, graphics, and character processing. It can be used either in batch mode or interactively. This book is the primary reference manual for the Speakeasy language and presents a nearly complete description of its capabilities. In addition, a complete listing of the Help Library, which contains brief descriptions of each of the SPEAKEASY functions or commands, is included. ERA

N78-21005# Hanford Engineering Development Lab., Richland, Wash.
INFORMATION STORAGE AND RETRIEVAL SYSTEM AT WESTINGHOUSE HANFORD COMPANY HANFORD ENGINEERING DEVELOPMENT LABORATORY (HEDL)
M. G. Theo 1977 33 p Presented at Conf. of Natl. Micrographics Assoc., Dallas, 17 May 1977
(Contract EY-76-C-14-2170)
(HEDL-SA-1193; Conf-770599-1) Avail: NTIS HC A03/MF A01

An information storage and retrieval system developed to store over two million documents on line is described. The system uses an interactive minicomputer to search for keyworded documents. Documents of interest can be displayed on CRTs or printed on microfilm reader-printers. ERA

N78-21006# California Univ., Berkeley. Lawrence Berkeley Lab.
AUTOMATIC DOCUMENT CLASSIFICATION BASED ON EXPERT HUMAN DECISIONS
D. F. Cahn and J. J. Herr 1 Mar. 1977 23 p refs Presented at Intern. Joint Conf. on Artificial Intelligence, Cambridge, Mass., 22-26 Aug. 1977

(Contract W-7405-eng-48)
(LBL-6164; Conf-770815-1) Avail: NTIS HC A02/MF A01

In order to identify parameters affecting classification tasks, several variations of conditional probabilistic and discriminant-based automatic document classification programs were constructed, and their performance against manual human document entry over several technical information data bases in the energy field were compared. With statistical correspondence between machine and manually generated classifications over fairly extensive document sets as the prime performance yardstick, systems emulated human classification decisions with 60 to 94 percent accuracy; in binary decisions, a simulation accuracy of up to 97 percent was achieved. Through analysis of the algorithms that performed at various levels within this range and through analysis of common characteristics of the document cases in which correspondence failed, it was possible to isolate several key parameters that regulate performance in systems of this sort. ERA

N78-21007# California Univ., Livermore. Lawrence Livermore Lab.
SCIENTIFIC DATA BASE MANAGEMENT AT LAWRENCE LIVERMORE LABORATORY: NEEDS AND A PROTOTYPE SYSTEM
Edward W. Birss, Stephen E. Jones, Daniel R. Ries, and Jeffry W. Yeh 3 Oct. 1977 14 p refs Presented at OECD/NEA Working Group on Nucl. Inform., Berkeley, Calif., 5-7 Oct. 1977
(Contract W-7405-eng-48)
(UCRL-80146; Conf-771062-1) Avail: NTIS HC A02/MF A01

A prototype scientific data base management system which uses a relational algebraic interactive use language is described. The software is comprised of a microprocessor, a parser, a parse tree generator, a parse tree interpreter, semantic routines, and data base access routines. ERA

N78-21008# National Science Foundation, Washington, D. C. Div. of Science Information.
FEDERAL SCIENTIFIC AND TECHNICAL COMMUNICATION ACTIVITIES, 1976 Annual Report, Jan. - Dec. 1976
Oct. 1977 115 p
(PB-272800/4; NSF-77-64) Avail: NTIS HC A06/MF A01 CSCL 05B

Descriptions are given of 1976 Federal scientific and technical information activities of more than 60 programs, including the Library of Congress and the Smithsonian Institution. The descriptions, provided voluntarily by Federal agencies, emphasize new developments and achievements rather than routine ongoing activities. A prefatory chapter analyzes and summarizes significant activities, developments and trends within the Federal scientific and technical information community, based on the agencies' submissions. Appendixes include a glossary of acronyms, a listing of key personnel associated with individual programs, and a general index. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N78-21009# Eurospace, Paris (France).
EVALUATION OF THE MARKET OPEN TO THE EUROPEAN SPACE INDUSTRY. A SUMMARY OF AVAILABLE EVALUATIONS CONCERNING THE WORLD MARKET OF SPACE PRODUCTS AND OF THE POTENTIAL MARKET SHARE FOR INDUSTRY [EVALUATION DU MARCHE ACCESSIBLE A L'INDUSTRIE SPATIALE EUROPEENNE. ETUDE EFFECTUEE POUR LE COMPTE DE L'AGENCE SPATIALE EUROPEENNE]
ESA Jun. 1977 73 p refs In FRENCH
(Contract ESTEC-3032/76-F-WWT(SC))
(ESA-CR(P)-1014) Avail: NTIS HC A04/MF A01

A summary of literature information concerning the potential market open to space industry, especially European industry, up to 1985, is presented. The method used for evaluation of the space product market is explained. Expected turnovers for the various sectors of the space market are tabulated. The turnovers are discussed from the point of view of European industry. Details are given of figures concerning the governmental and the commercial market. ESA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N78-21010*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BASELINE TESTS OF THE EPC HUMMINGBIRD ELECTRIC PASSENGER VEHICLE
Ralph J. Slavik, Edward A. Maslowski, Noel B. Sargent, and Arthur Birchenough Dec. 1977 46 p Prepared for DOE
(Contract EC-77-A-31-1011)
(NASA-TM-73760; E-9485; CONS-1011-5) Avail: NTIS HC A03/MF A01 CSCL 13F

The rear-mounted internal combustion engine in a four-passenger Volkswagen Thing was replaced with an electric motor made by modifying an aircraft generator and powered by 12 heavy-duty, lead-acid battery modules. Vehicle performance tests were conducted to measure vehicle maximum speed, range at constant speed, range over stop-and-go driving schedules, maximum acceleration, gradeability limit, road energy consumption, road power, indicated energy consumption, braking capability, battery charger efficiency, and battery characteristics. Test results are presented in tables and charts. Author

N78-21011*# IIT Research Inst., Chicago, Ill.
MANUFACTURING PROCESS APPLICATIONS TEAM (MATEAM) Yearly Report, 1977
E. R. Bangs and J. D. Meyer Jan. 1978 75 p refs
(Contract NAS8-32229)
(NASA-CR-150626; IITRI-H6056) Avail: NTIS HC A04/MF A01 CSCL 05A

Activities of the manufacturing applications team (MATeam) in effecting widespread transfer of NASA technology to aid in the solution of manufacturing problems in the industrial sector are described. During the program's first year of operation, 450 companies, industry associations, and government agencies were contacted, 150 manufacturing problems were documented, and 20 potential technology transfers were identified. Although none of the technology transfers has been commercialized and put in use, several are in the applications engineering phase, and others are in the early stages of implementation. The technology transfer process is described and guidelines used for the preparation of problems statements are included. Author

N78-21012*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HUMAN ELEMENT IN TECHNOLOGY TRANSFER
H. J. Peake Apr. 1978 13 p refs Presented at Am. Soc. for Public Admin. 39th Natl. Conf., Phoenix, Ariz., 9-12 Apr. 1978 Submitted for publication
(NASA-TM-78110) Avail: NTIS HC A02/MF A01 CSCL 05E

A transfer model composed of three roles and their linkages was considered. This model and a growing body of experience was analyzed to provide guidance in the human elements of technology transfer. For example, criteria for selection of technology transfer agents was described, and some needed working climate factors were known. These concepts were successfully applied to transfer activities. Author

N78-21013*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE PROCESS FOR TECHNOLOGY TRANSFER IN BALTIMORE
Thomas S. Golden Apr. 1978 15 p Presented at Am. Soc. for Public Admin. 39th Conf., Phoenix, Ariz., 9-12 Apr. 1978 Submitted for publication
(NASA-TM-78112) Avail: NTIS HC A02/MF A01 CSCL 05A

Ingredients essential for a successful decision process relative to proper technological choices for a large city were determined during four years of experience in the NASA/Baltimore Applications Project. The general approach, rationale, and process of technology transfer are discussed. Author

N78-21014*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CITY AND ITS NEED FOR TECHNOLOGY
Bernard L. Berkowitz (Mayor's Office, Baltimore) Apr. 1978 9 p Presented at 1978 Am. Soc. for Public Admin. 39th Natl. Conf., Phoenix, Ariz., 9-12 Apr. 1978 Submitted for publication
(NASA-TM-79530) Avail: NTIS HC A02/MF A01 CSCL 05A

An experimental program has been undertaken to explore the process of identifying and transferring newer technology for the benefit of the city. This paper describes the nature of the problems involved in the experiment, some of the areas of supposed commonality with other cities and some of the prerequisites for any city to become involved with technological innovation. Author

N78-21015*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HISTORY AND NATURE OF THE BALTIMORE APPLICATIONS PROJECT
H. J. Peake Apr. 1978 12 p refs Presented at Am. Soc. for Public Admin. 39th Natl. Conf., Phoenix, Ariz., 9-12 Apr. 1978 Submitted for publication
(NASA-TM-79531) Avail: NTIS HC A02/MF A01 CSCL 05A

The Baltimore Applications Project (BAP), an experiment jointly conducted by the City of Baltimore and the National Aeronautics and Space Administration (NASA), was begun in May 1974 in response to a request by the City. The main purpose of the BAP is the identification of technology for beneficial application to the City operations. An independent evaluation, performed after three years of operation, indicates very good project results and confirms the choices of the experiment's basic features. The BAP demonstrates one way to achieve successful intergovernmental transfer of Federal technology. Author

N78-21016# Energy Research and Development Administration, Washington, D. C. Div. of Transportation Energy Conservation.
INTRODUCTION TO THE ERDA ELECTRIC AND HYBRID DEMONSTRATION PROJECT
1 Mar. 1977 64 p refs
(ERHQ-0008) Avail: NTIS HC A04/MF A01

Provisions of the Legislative Act establishing an ERDA program for research, development, and demonstration designed to promote electric and hybrid technologies and to demonstrate their commercial feasibility are summarized. Emerging vehicle systems builders can draw on the accelerated technology through acquisition of improved competitively developed components, technology reports, and specifications. Further feedback to both systems and component developers will be provided through dissemination of user data from the demonstration program. An approach for implementation of the financial incentives for small business and loan guarantees as well as studies into other incentive areas as authorized in the legislation is discussed. Social and economic impacts are considered, and safety aspects are discussed. ERA

N78-21017# Williams and Works, Grand Rapids, Mich.
INVESTIGATION OF THE FEASIBILITY OF TERTIARY TREATMENT OF MUNICIPAL WASTEWATER STABILIZATION POND EFFLUENT USING RIVER WETLANDS IN MICHIGAN
Jeffrey C. Sutherland 1977 171 p refs
(Grant NSF ENV-76-20812)
(PB-275283/0; NSF/RA-770222) Avail: NTIS HC A08/MF A01 CSCL 13B

Seventy-five Michigan Southern Peninsula rural municipalities with populations ranging from 360 to 2,800, served by treatment ponds, and with proximal streams, were visited in aerial reconnaissance. Of these, 35%-40% are estimated to have viable river wetlands for use as alternatives to upland spray irrigation and chemical tertiary treatment of municipal wastewater stabilization pond effluent. Operation energy consumption would be minimized by low site pressure-head requirements and the generally low-lying position of river wetlands. The potential capital cost savings in use of wetlands average approximately $320,000 (1977 dollars) relative to upland irrigation, and approximately $150,000 relative to chemical treatment. GRA

N78-21018# Washington Univ., Seattle. Urban Transportation Program.
UTILIZING GEOGRAPHIC BASEFILES FOR TRANSPORTATION ANALYSIS: A NETWORK BASEFILE SYSTEM Research Report, Jul. 1976 - Jun. 1977
Claus D. Gehner Jun. 1977 46 p refs Sponsored by Urban Mass Transportation Admin.
(PB-275586/6; RR-77-3; UMTA-WA-11-0005-78-1) Avail: NTIS HC A03/MF A01 CSCL 13B

The existence of geographic base files (GBF) for most large urban areas offers a significant resource for the network models required for many transportation studies. The thrust of the Network Basefile System (NETBASIS) development, underway at the University of Washington since 1974, is to build upon the existing GBF data resource (which has been operational for the city of Seattle for many years) and to provide a general purpose transportation network data base together with the required data manipulation and display software. A status report on the NETBASIS development as of June 1977 is presented. GRA

88 SPACE SCIENCES (GENERAL)

N78-21019*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A BIBLIOGRAPHY ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE
Eugene F. Mallove (Analytic Sci. Corp., Reading, Mass.), Mary M. Connors, Robert L. Forward (Hughes Res. Labs., Malibu, Calif.), and Zbigniew Paprotny (Orzeszkowej, Poland) Mar. 1978 135 p refs
(NASA-RP-1021) Avail: NTIS HC A07/MF A01 CSCL 05B

This report presents a uniform compilation of works dealing with the search for extraterrestrial intelligence. Entries are by first author, with cross-reference by topic index and by periodical index. This bibliography updates earlier bibliographies on this general topic while concentrating on research related to listening for signals from extraterrestrial intelligence. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N78-21020 Massachusetts Univ., Amherst.
THE SECULAR BEHAVIOR OF PULSAR INTEGRATED PROPERTIES Ph.D. Thesis
David John Helfand 1977 235 p
Avail: Univ. Microfilms Order No. 7730556

Data obtained during long term radio astronomy observations

of pulsars are analyzed. Topics discussed include the pulsar flux memory mechanism, pulse arrival times and transverse velocity determinations, and pulse shape behavior. Observations of the Crab Nebula are presented and discussed in terms of a model in which a large cloud of turbulent material drifts across our lines of sight to the pulsar. Dissert. Abstr.

N78-21021 Maryland Univ., College Park.
STUDIES OF TRANSIENT X-RAY SOURCES WITH THE ARIEL 5 ALL-SKY MONITOR Ph.D. Thesis
Louis Joseph Kaluzienski 1977 252 p
Avail: Univ. Microfilms Order No. 7730536

Continuous, long term observations of more than 80% of the 3-6 keV X-ray sky by the imaging X-ray detector onboard the Ariel-5 satellite revealed a broad spectrum temporal variability of the permanent galactic X-ray sources, and led to the detection of regular variability on time scales of days to weeks in several sources. Light curves of three new sources are reported. Their characteristic luminosities, rates of occurrence, and spatial distributions are consistent with a roughly uniform galactic disk population consisting of at least two source subclasses with one group radiating at approximately the Eddington limit. While both subclasses are probably unrelated to the classical optical novae, they are most readily interpreted within the standard mass-exchange X-ray binary model. Dissert. Abstr.

N78-21022 Northeastern Univ., Boston, Mass.
THE INTERNAL STRUCTURE OF CHARGED INHOMOGENEOUS, STATIC, RELATIVISTIC SPHERES Ph.D. Thesis
Erlvada Anne Crider Olson 1977 143 p
Avail: Univ. Microfilms Order No. 78-00738

The set of static, spherically symmetric Einstein Maxwell equations can be made determinate for a system containing fundamentally different types of particle by the addition of equations obtained from the extremization of the energy of the static configuration with respect to variations in the number densities of the various particle types. The new determinate set of equations was used to model a white dwarf star and a neutron star composed of charged particles. The charge configurations of these stars are given and their relative values were compared. It was found that the static charges of these bodies are quite small, as is usually assumed, and that the new models differ little from the standard uncharged relativistic models.
Dissert. Abstr.

N78-21023*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
INFRARED OBSERVATIONS OF LATE TYPE STARS
K. M. Merrill 1977 54 p refs Presented at the 42d I.A.U. Symp., Bamberg, West Germany, Sep. 1977 Sponsored in cooperation with NASA, NSF, and AF
(NASA-CR-156088) Avail: NTIS HC A04/MF A01 CSCL 03A

Substantive mass loss resulting in appreciable circumstellar dust envelopes is common in late-type stars. The evolutionary history and physical state of a cool star determine the chemistry within the outer stellar atmosphere mirrored by the molecular and particulate material present in the envelope. The observational consequences of this debris determined by moderate spectral resolution infrared spectrophotometry are reviewed. Significant information is provided by observations of the emergent energy flux of both the cool stellar photosphere and of the circumstellar dust envelope. The observation suggests that mass-loss occurs to some degree throughout late stellar evolutionary phases and that occasional periods of high mass loss are not uncommon.
Author

N78-21024# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
COMPUTATION OF VARIOUS SOLAR ASPECT ANGLES FROM A LOW-ORBITING EARTH OBSERVATION SATELLITE
A. E. Pietrass 25 Jul. 1977 21 p refs
(DLR-IB-552-77/21) Avail: NTIS HC A02/MF A01

The orientation of the vector to the sun, called sun vector here for brevity relative to the orbit normal vector and relative to fixed or movable satellite panels is of special importance for earth observing satellites in drifting orbits, such as the ESA Sun Earth Observatory and Climatology Satellite. A drifting orbit is referred to as an orbit with high modal procession rate. The sun vector is expressed in components of the earth centered inertial frame. The orientation with respect to other frames of reference is found by proper coordinate transformations. The computational procedure for time histories of various solar aspect angles is outlined and example results are presented.
Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N78-21025 Washington Univ., Seattle.
THE STRUCTURE AND DYNAMICS OF THE SPIRAL GALAXY NGC 4736 Ph.D. Thesis
Robert Andrew Schommer 1977 199 p
Avail: Univ. Microfilms Order No. 78-00972

A photometric study in the UBVr system was completed on the outer ring spiral galaxy NGC 4736. Photoelectric spot observations are combined with previous data in order to calibrate plates and obtain magnetude and color profiles. Isophote maps, derived from PDS scans of fourteen plates, are presented for each color at several resolution values. A prominent nuclear component, a possible lens, an exponential disk, and an outer ring were revealed. An inner ring of bright H (2) regions and OB associations is prominent. Isophotometry shows the galaxy to be quite azimuthally symmetric, with two faint arms appearing on the U, B, and V plates. Dissert. Abstr.

N78-21026 Oklahoma State Univ., Stillwater.
A FINE-DETAILED ANALYSIS OF THE CHEMICAL ABUNDANCES FOR THE PECULIAR A-STAR BETA CORONAE BOREALIS Ph.D. Thesis
Thomas Morris Jordan 1977 152 p
Avail: Univ. Microfilms Order No. 78-01275

Analysis of selected absorption lines in the spectrum of Beta Coronae Borealis was performed using a detailed model atmosphere technique. A scaled solar temperature distribution was utilized for the computations of the opacity, gas and electron pressures as functions of the optical depth at 5000A. An analysis of neutral and singly ionized iron lines was performed to assess the amount of turbulence in the atmosphere. From the curves of growth constructed independently for two separate wavelength regions for the Fe I lines, a depth independent microturbulence of approximately 1.5 km/s was needed in order to adequately describe the observed equivalent widths. A similar value was confirmed by the Fe II absorption lines. Dissert. Abstr.

N78-21027 California Univ., San Diego.
X-RAY EMISSION FROM CLUSTERS OF GALAXIES Ph.D. Thesis
Yoel Rephaeli 1977 120 p
Avail: Univ. Microfilms Order No. 7800785

Both Compton and thermal models for the X-ray emission from sources confidently identified with clusters of galaxies were used to study the nature of the emission mechanism. A Compton-diffusion model is investigated in which relativistic electrons ejected from central cluster galaxies diffuse in the intracluster space through scattering by static magnetic field inhomogeneities. The X-ray and radio fluxes and their spatial distribution are compared with observations for the Coma cluster. A convective mode of propagation for the electrons is qualitatively considered. Observations of the line emission from the Virgo, Perseus and the Coma clusters are analyzed as well as the depletion of the microwave background brightness in the direction of some clusters. Dissert. Abstr.

N78-21028*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEORY OF FLUX ANISOTROPIES IN A GUIDING CENTER PLASMA
T. J. Birmingham and T. G. Northrop Feb. 1978 19 p refs

(NASA-TM-78090) Avail: NTIS HC A02/MF A01 CSCL 03B

The one particle distribution function f on the scale of the bounce motion of particles in a magnetic field B is considered. The Vlasov equation is expanded through O(epsilon) in the adiabatic parameter which is the ratio of particle gyroradius to scale length of the magnetic field. Because f is directly proportional to particle flux differential in kinetic energy and solid angle, f is in principle measurable in space experiments, and the analysis is tailored to be explicitly applicable to space problems. To O(1), f is gyrotropic; its first velocity moment is (if non-vanishing) parallel to B, and hence macroscopic parallel flow is included in this term. The O(epsilon) contribution is non-gyrotropic and macroscopic flow parallel to B plus additional parallel flow results from these terms. The degree of non-gyrotropy and the amount of cross-field macroscopic flow depend on the perpendicular component of the electric field, on curvature and shear in the magnetic field, and on the spatial gradient, pitch angle derivative, and speed derivative of the lowest order distribution function. Author

N78-21029*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

BARYON SYMMETRIC BIG-BANG COSMOLOGY

F. W. Stecker Apr. 1978 25 p refs Submitted for publication

(NASA-TM-78114) Avail: NTIS HC A02/MF A01 CSCL 03B

The framework of baryon-symmetric big-bang cosmology offers the greatest potential for deducing the evolution of the universe as a consequence of physical laws and processes with the minimum number of arbitrary assumptions as to initial conditions in the big-bang. In addition, it offers the possibility of explaining the photon-baryon ratio in the universe and how galaxies and galaxy clusters are formed, and also provides the only acceptable explanation at present for the origin of the cosmic gamma ray background radiation. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N78-21030 California Univ., Berkeley.

INFRARED HETERODYNE SPECTROSCOPY OF CARBON DIOXIDE IN PLANETARY ATMOSPHERES Ph.D. Thesis

Albert Louis Betz 1977 167 p

Avail: Univ. Microfilms Order No. 7731291

An infrared heterodyne spectrometer was developed for high resolution studies of spectral lines in planetary atmospheres. The instrument relies on the principles of coherent detection and is similar to a microwave spectral line receiver. The source radiation to be detected is first mixed with a coherent local oscillator signal in a square law detector, and the difference frequencies are then analyzed electronically in a multichannel filter bank. The local oscillator is a stable CO2 laser operating in the wavelength region near 10 micrometers, while the square law detector is a high speed infrared photodiode. Dissert. Abstr.

N78-21031 Pittsburgh Univ., Pa.

SPECTRAL REFLECTIVITIES OF THE GALILEAN SATELLITES OF JUPITER AND SATURN'S SATELLITE, TITAN Ph.D. Thesis

Robert M. Nelson 1977 107 p

Avail: Univ. Microfilms Order No. 78-01821

A spectrophotometric observational program of the Galilean satellites of Jupiter and Saturn's satellite Titan was carried out at 0.004 micrometer resolution over the spectral range 0.32-0.80 micrometers. The results of the spectrophotometry establish the visible spectra of these satellites at a much higher resolution and to a greater precision than previous work. J1 (Io) was found to have a spectral edge at 0.33 micrometers that has not been previously reported. A tentative model for the surface of J1 is proposed which consists of the red allotrope of sulfur mixed with uniformly white scattering salts. The spectrum of J2 (Europa) shows evidence of a band at 0.56 micrometers that has not been reported previously. J3 (Ganymede) and J4 (Callisto) show no spectral features that have not been previously reported. The ultra-violet reflectivity variation as a function of rotational phase angle for all the Galilean satellites was confirmed. Dissert. Abstr.

N78-21032*# Leiden Univ. (Netherlands).

MAPS OF JOVIAN RADIO EMISSION Final Technical Report, 1 Oct. 1976 - 1 Oct. 1977

Imke dePater 1 Oct. 1977 57 p refs

(Grant NsG-7264)

(NASA-CR-156129) Avail: NTIS HC A04/MF A01 CSCL 03B

Observations were made of Jupiter with the Westerbork telescope at all three frequencies available: 610 MHz, 1415 MHz, and 4995 MHz. The raw measurements were corrected for position errors, atmospheric extinction, Faraday rotation, clock, frequency, and baseline errors, and errors due to a shadowing effect. The data were then converted into brightness distribution of the sky by Fourier transformation. Maps of both thermal and nonthermal radiation were developed. Results indicate that the thermal disk of Jupiter measured at a wavelength of 6 cm has a temperature of 236 + or - 15 K. The radiation belts have an overall structure governed by the trapping of electrons in the dipolar field of the planet with significant beaming of the synchrotron radiation into the plane of the magnetic equator. P.R.A.

N78-21033*# National Aeronautics and Space Administration, Washington, D. C.

INVESTIGATION OF THE PHENOMENON OF THE BIG COMET OF 1858

C. F. Pape Sep. 1977 53 p refs Transl. into ENGLISH from Astron. Nachr. (East Ger.), v. 49, no. 1127-1174, 1859? p 313-354 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-2790)

(NASA-TM-75193) Avail: NTIS HC A04/MF A01 CSCL 03B

Various aspects of the large comet of 1858 including the luminosity of the core and the shape, intensity and position of the tail with respect to the sun and stars are described and then compared with the large comet of 1744 described by Heinsius and Halley's comet of 1835. The purpose of these observations is to try to gain a clearer understanding of the nature of the polar force from the sun acting on the comet. This force is said to differ from the usual force of gravity. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N78-21034+ European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.

RIGIDITY INDEPENDENT CORONAL PROPAGATION AND ESCAPE OF SOLAR PROTONS AND ALPHA PARTICLES

C. Perron, V. Domingo, R. Reinhard, and K.-P. Wenzel 1977 7 p refs Presented at 15th Intern. Cosmic Ray Conf., Plovdiv, Bulgaria, 13-26 Aug. 1977

Avail: NTIS HC A02

The azimuthal variation of the p/alpha ratio is studied with three different methods: (1) a statistical study of 42 solar proton and alpha-particle events during 1972-74, using the 9-36 MeV/n data of the ESA/SSD experiment on HEOS-2, (2) by looking at the p/alpha ratios of individual events with two spacecraft separated in azimuth (Pioneer 10/11 and HEOS-2), (3) by looking at the p/alpha ratio with single spacecraft over an extended time period. The results are consistent with each other and lead to the conclusion that coronal propagation and escape are rigidity independent. This is also the agreement with the proton and alpha-particle spectral exponents found to be independent of the flare heliolongitude. Author (ESA)

N78-21035+ Johns Hopkins Univ., Laurel, Md. Lab. of Applied Physics.

CORONAL STRUCTURE OF THE APRIL 10, 1969 SOLAR FLARE PARTICLE EVENT

R. E. Gold, E. P. Keath, E. C. Roelof, and R. Reinhard (ESTEC) 1977 7 p refs Presented at the 15th Intern. Cosmic Ray Conf., Plovdiv, Bulgaria, 13-26 Aug. 1977

(Contract N00017-72-C-4401; Grant ATM76-23816)

Avail: NTIS HC A02

The April 10, 1969 flare particle event and its associated solar wind disturbance were examined by combining Pioneers 6-9 and Explorer 34 observations of 10 MeV protons with measurements of solar wind plasma on the same spacecraft. The particle fluxes and plasma velocities are mapped back to the sun and compared at the same time of observation to give the instantaneous coronal emission profiles of flare-accelerated protons and solar wind. While the plasma preferentially escapes over the flare site with a half-width of approx 50 deg, the bulk of energetic particles escapes from a quiet coronal region, almost 100 deg to the west of the flare site. The particle profiles reveal strong exponential longitudinal gradients in the corona, which persist up to 14 days after the flare. Author (ESA)

N78-21036+ European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.

THE MARCH 5, 1972 SOLAR EVENT: CORONAL CONTROL OF PARTICLE RELEASE

R. Reinhard, V. Domingo, C. Perron, and K.-P. Wenzel 1977 7 p refs Presented at the 15th Intern. Cosmic Ray Conf., Plovdiv, Bulgaria, 13-26 Aug. 1977

Avail: NTIS HC A02

The time-intensity profiles of 1-9 MeV and 9-36 MeV protons observed by the ESA-SSD detector system on HEOS-2 during the March 5, 1972 event display a number of unusual features. The most prominent is a plateau-like peak lasting for almost a day. When mapping the particle fluxes back to the sun, it is seen that the plateau is caused by a large chromospheric polarity cell which is 60 to 100 deg away from the acceleration region and uniformly populated with particles. A short-lived (3 h) particle intensity increase with strong sunward flow is observed during the decay phase and tentatively associated with a magnetic looptype structure in the interplanetary medium. Author (ESA)

N78-21037# Tufts Univ., Medford, Mass. Dept. of Physics.

FINE SCALE RADIO STUDIES OF THE SUN Technical Report, 1 Aug. 1976 - 1 Oct. 1977

Kenneth R. Lang 15 Oct. 1977 61 p refs

(Contract F19628-76-C-0280)

(AD-A047612; AFGL-TR-77-0208; SR-1) Avail: NTIS HC A04/MF A01 CSCL 03/2

Major flare eruptions in solar active regions create geophysical disturbances which may seriously disrupt Air Force communication and surveillance systems. This report discusses interferrometric observations of solar active regions at centimeter wavelengths which show that the emission comes from sources which are only a few seconds of arc in size. The circular polarization of these small-scale features indicates a direct connection with the magnetic fields in active regions. Significant changes in the circular polarization of the fine scale regions only occurs in the few hours prior to flare eruptions. This result suggests that it is changes in magnetic field configurations which trigger flare emission, and that routine observations of the small-scale trigger sources might lead to a reliable flare forecast technique. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N78-21038+ European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.

COSMIC RAY PROPAGATION: ENERGY-DEPENDENCE OF LEAKAGE MEAN PATH LENGTH

Pierre Fontes (Centre de Spectrometrie Nucl. et de Spectrometrie de Masse), Jean-Paul Meyer (CEA, Saclay, France), and Claude Perron 1977 7 p refs Presented at the 15th Inter. Cosmic Ray Conf., Plovdiv, Bulgaria, 13-26 Aug. 1977

Avail: NTIS HC A02

Propagation calculations making use of the latest experimental nuclear cross-sections, were carried out in an attempt to account for the cosmic ray chemical abundances and their variations as a function of energy. A survey of the available cosmic ray data was made, and these data consistently corrected for interactions in the atmosphere. Secondary to primary ratios, which were selected on the basis of their significance can be accounted for, either by a continuous decrease of the leakage mean path length with energy, or by two distinct propagation regimes, one below approx 5 GeV/n, the other between 20 and 100 GeV/n, with a transition region in between.

Author (ESA)

N78-21039*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE COMPOSITION OF COROTATING ENERGETIC PARTICLE STREAMS

R. E. McGuire, T. T. Von Renvinge, and F. B. McDonald Mar. 1978 25 p refs Submitted for publication

(NASA-TM-78105) Avail: NTIS HC A02/MF A01 CSCL 03B

The relative abundances of 1.5 to 23 MeV/nucleon ions in corotating nucleon streams were compared with ion abundances in particle events associated with solar flares and with solar and solar wind abundances. He/O and C/O ratios were found to be a factor of the order two to three times greater in corotating streams than in flare associated events. The distribution of H/He ratios in corotating streams was found to be much narrower and of lower average value than in flare associated events. H/He in corotating energetic particle streams compared favorably both in lack of variability and numerical value to H/He in high speed solar wind plasma streams. This comparison suggested that the source population for the corotating energetic particles was the solar wind. Author

N78-21040*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE DIFFUSE COMPONENT OF THE COSMIC X-RADIATION

Elihu Boldt and C. Garmire (Calif. Inst. of Technol., Pasadena) Mar. 1978 40 p refs Presented at Ann. Meeting of the Am. Assoc. for the Advan. of Sci., Wash. D. C., 13 Feb. 1978 Submitted for publication

(NASA-TM-78106) Avail: NTIS HC A03/MF A01 CSCL 03B

The A-2 experiment on HEAO-1 is specifically developed to study the diffuse radiation of the entire X-ray sky over a wide bandwidth, covering both the soft X-ray emission from nearby regions of the galaxy and the isotropic hard X-radiation indicative of remote extragalactic origins. A partial conclusion from the experiment is that a hot thermal plasma, on a scale comparable to that of the universe, may be the principal source of hard X-radiation characteristic of the extragalactic sky. Some key features of this background were defined. Author

99 GENERAL

N78-21041# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCES AND TECHNOLOGY

31 Mar. 1978 58 p Transl. into ENGLISH from various Russian journals

(JPRS-70873) Copyright. Avail: Issuing Activity

The role of sociology in smoothing the transition to automation is explored along with advances in computer science and automation technology. Operations at the Baykonur launch complex are described and contrasted with American techniques. The development of a pulsed metal vapor laser microscope is also reported. For individual titles, see N78-21042 through N78-21043.

N78-21042# Joint Publications Research Service, Arlington, Va.

VISIT TO THE BAYKONUR SPACEPORT **c14**

V. Karin, A. Khaldeyev, and I. Yudin *In its* Transl. on USSR Sci. and Technol. (JPRS-70873) 31 Mar. 1978 p 23-39 Transl. into ENGLISH from Nauk Zhizh (Moscow), no. 1, 1978 p 66-75 (For availability see N78-21041 11-99)

Copyright. Avail: Issuing Activity

Factors considered in the site selection for the largest Russian launch complex are reviewed. The functions and operations of the spaceport where booster rockets are horizontally assembled, tested, mated, and launched are described. A.R.H.

N78-21043# Joint Publications Research Service, Arlington, Va.

NEW LASER MICROSCOPE DESCRIBED **c36**

M. Kazaryan *In its* Transl. on USSR Sci. and Technol. (JPRS-70873) 31 Mar. 1978 p 40-41 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), no. 14 (15990), 17 Jan. 1978 p 4 (For availability see N78-21041 11-99)

Avail: Issuing Activity

A laser microscope which allows the projection onto a screen of a 15,000 power magnified image of the smallest objects, and which operates in the yellow to green region of the spectrum was developed. A ceramic tube serves as the heart of the device where, at a temperature of 1600 C, copper vapor is formed. Copper atoms, excited by an electric current passing through the tube, amplify light. When such an amplifer is combined with the usual projection microscope, the need for illumination of the object to be magnified is eliminated; the light arising from the ceramic tube is sufficient to illuminate the microscopic specimen. The illumination intensity can be varied over a large range, and the power of the emitted beam (on the screen) remains practically constant. The amplifiers can be used not only with microscopes, but with other optical systems. A.R.H.

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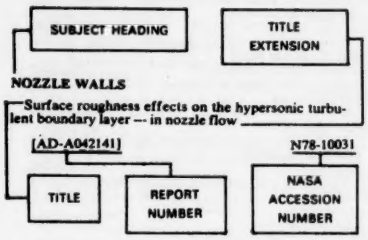

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The Shock and Vibration Digest, volume 9, number 6 --- bibliographies
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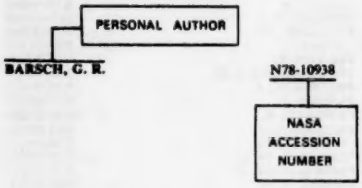

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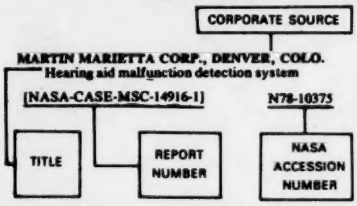

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CONSIGLIO NAZIONALE DELLE RICERCHE, FRASCATI [ITALY].
A high precision on board computing star sensor
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CONTEMPORARY SYSTEMS, INC., JAFFREY, N. H.
Design data brochure for CSI series V solar heating system
[NASA-CR-150600] N78-20615

CORNELL UNIV., ITHACA, N. Y.
Probabilistic models for the tensile strength of composite materials
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Creep bending of beams and plates using a state-variable approach
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An experimental study of two-phase hydrothermal convection in a porous medium with applications to geological problems
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CORPS OF ENGINEERS, WALTHAM, MASS.
The use of the LANDSAT data collection system and imagery in reservoir management and operation
[E78-10102] N78-20569

CRYSTAL SYSTEMS, INC., SALEM, MASS.
Scale-up of the heat exchanger method to grow 14.5 inch diameter sapphire boule for IR dome
[AD-A050325] N78-20979

D

DAMES AND MOORE, PHOENIX, ARIZ.
Annotated bibliography of natural resource information: Northwestern New Mexico
[PB-276024/7] N78-20597

DANISH METEOROLOGICAL INST., COPENHAGEN.
The QHM. Contributions to the theory and practice of the quartz horizontal magnetometer
[DMI-GEOPHYS-PAPERS-R-50] N78-20487
Occurrences of the polar slant E condition - SEC at Narssarssuaq, Godhavn, Thule, 1973
[DMI-GEOPHYS-PAPERS-R-47] N78-20707

DECISIONS AND DESIGNS, INC., MCLEAN, VA.
Preference modeling of utility surfaces
[AD-A050134] N78-20864

DEFENCE RESEARCH ESTABLISHMENT, OTTAWA. [ONTARIO].
Application of ultrasound and microwaves during treatment of fabrics with liquid-repellent finishes
[AD-A046387] N78-20344
Computer-controlled antenna arrays
[AD-A039824] N78-20396
A porous zinc electrode for use at very low temperatures
[AD-A047787] N78-20445
A high-range solid-state radiacmeter with digital display
[AD-A044283] N78-20482
Evaluation of a reserve-primary zinc/air battery to power the AN/TRN-30 beacon
[AD-A044315] N78-20623
The AIRI fusion cast lead chloride. Part 1: Preliminary evaluation of suitability as cathode in sonobuoy batteries
[AD-A043635] N78-20624

Nickel/cadmium aircraft batteries: Battery alarm unit
[AD-A039521] N78-20631
Nickel/cadmium aircraft batteries: Rapid electrolyte exchange technique
[AD-A039335] N78-20632
Separator material for reserve-primary zinc/air batteries
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The cyclic voltammetry of lead and lead-antimony battery grid alloy in aqueous sulphuric acid at 25 to -40 deg C
[AD-A036290] N78-20634
Nickel/cadmium aircraft batteries: Single sensor temperature monitoring
[AD-A037722] N78-20635
Nickel/cadmium aircraft batteries: Multichannel gassing-rate meter
[AD-A039735] N78-20636

DEFENCE RESEARCH ESTABLISHMENT VALCARTIER [QUEBEC].
Polyether and polyester binders in composite propellants
[AD-A038801] N78-20352
An efficient, purely chemical HCl laser
[AD-A036291] N78-20491
Optimization of the pre-pumping NO/ClO2 chemistry in a purely chemical HCl laser
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Steady state thermal blooming of multipulse laser beams
[AD-A037218] N78-20493
Purely chemical hydrogen chloride laser based upon the reaction of chlorine atoms with hydrogen bromide
[AD-A038506] N78-20494
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Use of spatial filtering to match wide dynamic range grayscale imagery to a lower resolution display
[AD-A037846] N78-20950
Digital area correlation tracking by sequential similarity detection
[AD-A047712] N78-20951

DELAWARE UNIV., NEWARK.
The gas phase chemistry of metal and metal containing ions with neutral organic species
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Studies in metal-metal bonded systems
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Moving boundary problems for a class of singular parabolic partial differential equations
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On a class of boundary value problems for a composite system of first order differential equations
[AD-A050375] N78-20858
On Riemann boundary value problems for certain linear elliptic systems in the plane
[AD-A050376] N78-20859
Lattice dynamics of heated nitramines
[AD-A050382] N78-20978

DEPARTMENT OF THE ENVIRONMENT, OTTAWA [ONTARIO].
Retransmission of hydrometric data in Canada
[E78-10091] N78-20566

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE [WEST GERMANY].
A semiempirical method for predicting normal force and centre of pressure characteristics of wing body combinations at supersonic speeds including the nonlinear effects of body crossflow
[DLR-FB-77-27] N78-20090

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN [WEST GERMANY].
Investigations of annular dampers for spinning space vehicles
N78-20195
Orbit determination error analysis through satellite-satellite systems
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A general technique for the construction of adaptive laws for arbitrarily fast adaptive observers
[DLR-IB-552-77/18] N78-20875
Studies in the frequency domain design of multivariable systems
[DLR-IB-552-77/24] N78-20876
Computation of various solar aspect angles from a low-orbiting earth observation satellite
[DLR-IB-552-77/21] N78-21024

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART [WEST GERMANY].
An overview of the RIT-10 radio-frequency thruster system
N78-20249

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, TRAUEN [WEST GERMANY].
A new catalyst for monopropellant hydrazine thrusters
N78-20242
Thermal hydrazine decomposition: Investigation on a promising technique for future satellite propulsion
N78-20246
Spectroscopic investigations of solid rocket propellant combustion
[DLR-IB-456-77/10] N78-20357

DEUTSCHER WETTERDIENST, OFFENBACH AM MAIN [WEST GERMANY].
Reports from the German Meteorological Service. Volume 15, no. 113: Catalog of large scale weather patterns in Europe
[ISBN-3-88148-155-9] N78-20713

DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
The finite element applied to the analysis of mechanisms and machines
N78-20367

DORNIER-SYSTEM G.M.B.H., FRIEDRICHSHAFEN [WEST GERMANY].
Modern wing technology for general aviation aircraft
[BMFT-FB-W-77-14] N78-20127
Eigenvalue analysis of the non-rigid three-axis controlled gimbal-system for the hardmounted Spacelab instrument pointing subsystem
N78-20216

DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
Expansion of flight simulator capability for study and solution of aircraft directional control problems on runways
[NASA-CR-2970] N78-20118

DRAPER [CHARLES STARK] LAB., INC., CAMBRIDGE, MASS.
Reliable dual-redundant sensor failure detection and identification for the NASA F-8 DFBW aircraft
[NASA-CR-2944] N78-20141

DUKE UNIV., DURHAM, N. C.
The biomedical effects of the hyperbaric environment
[AD-A047173] N78-20766

E

ECOLOGY CONSULTANTS, INC., FORT COLLINS, COLO.
Annotated bibliography of natural resource information: Northwestern New Mexico
[PB-276024/7] N78-20597

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Floating power optimization studies for the cooling system of a geothermal power plant
[TREE-1164] N78-20646

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH [SWITZERLAND].
Essential aspects of the conception and application of the digital cartographic drafting machine of the ETH Zurich
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ELECTROMAGNETIC COMPATIBILITY ANALYSIS CENTER, ANNAPOLIS, MD.
The impact of a proposed active BCAS on ATCRBS performance in the Washington, D. C., 1981 environment
[AD-A048589/6] N78-20099
Interference analysis between TRSB microwave landing system and adjacent C-band radars
[AD-A049882] N78-20101

ELLIOTT-AUTOMATION SPACE AND ADVANCED MILITARY SYSTEMS LTD., CAMBERLEY [ENGLAND].
Electromagetic compatibility of an avionic subsystem
N78-20412

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, MORGANTOWN, W. VA.
Diffusivity model for fluid flow and heat conduction in porous media
[MERC/SP-77/2] N78-20474

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, WASHINGTON, D. C.
Introduction to the ERDA electric and hybrid demonstration project
[ERHQ-0008] N78-21016

ENERGY RESEARCH CORP., DANBURY, CONN.
Development of a prototype regeneration carbon dioxide absorber
[NASA-CR-152063] N78-20773

ENGINEERING SCIENCES DATA UNIT, LONDON [ENGLAND].
Subsonic pressure drag of conical boat-tails
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ENGINS MATRA, VELIZY [FRANCE].
Application of a one degree of transverse freedom system to the attitude control of an operational Ariane large satellite
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Magnetotorquing for the attitude control of geostationary satellites
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Multiple-microprocessor systems in attitude and orbit control subsystems
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Satellite design aspects of applying electric propulsion for geostationary satellites
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ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
Procedures for the preparation of emission inventories for volatile organic compounds, volume 1
[PB-275292] N78-20663

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.
Water quality management accomplishments, compendium 1
[PB-275631] N78-20996

ERIE TECHNOLOGICAL PRODUCTS OF CANADA LTD., TRENTON [ONTARIO].
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A046922] N78-20429

ERNO RAUMFAHRTTECHNIK G.M.B.H., BREMEN [WEST GERMANY].
Performance demonstration of 0.5 N and 2.0 N monopropellant hydrazine thrusters
N78-20240

ERNST-MACH-INST., FREIBURG [WEST GERMANY].
The impact flash. An indicator for processes in hypervelocity collisions
[REPT-2/77] N78-20519

EUROPEAN SPACE AGENCY, PARIS [FRANCE].
Attitude control of space vehicles: Technological and dynamical problems associated with the presence of liquids
[ESA-SP-129] N78-20178
Attitude and orbit control systems
[ESA-SP-128] N78-20198

EUROPEAN SPACE OPERATIONS CENTER, DARMSTADT [WEST GERMANY].
Optimal orbit control for station keeping within the Multisatellite Support System [MSSS]
N78-20215

EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTER, NOORDWIJK [NETHERLANDS].
ESA's activities in the fields of dynamics and technology related to the presence of liquids on-board spacecraft
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An autonomous system for orbit injection
N78-20212
Payload signal conditioning and processing
N78-20415
Rigidity independent coronal propagation and escape of solar protons and alpha particles
N78-21034
The March 5, 1972 solar event: Coronal control of particle release
N78-21036
Cosmic ray propagation: Energy-dependence of leakage mean path length
N78-21038

EUROSPACE, PARIS [FRANCE].
New television services foreseen in Europe in the era of the direct television satellite, volume 1
[ESA-CR[P]-1019-VOL-1] N78-20416
New television services foreseen in Europe in the era of the direct television satellite. Volume 2: Annexes
[ESA-CR[P]-1019-VOL-2] N78-20417
Evaluation of the market open to the European space industry. A summary of available evaluations concerning the world market of space products and of the potential market share for industry
[ESA-CR[P]-1014] N78-21009

F

FEDERAL COBOL COMPILER TESTING SERVICE, WASHINGTON, D. C.
COBOL compiler validation
[AD-A050282] N78-20785
COBOL compiler validation
[AD-A050283] N78-20786

FERRANTI LTD., EDINBURGH [SCOTLAND].
Hardware aspects of inertial attitude control systems
N78-20221

FLORIDA STATE UNIV., TALLAHASSEE.
An evaluation of a metal filament vaporizer sample introduction system for adc arc plasma jet atomic emission source
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Temperature wave propagation in a non-gray radiating fluid
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Multistate coherent systems
[AD-A049994] N78-20527

The contribution of synoptic scale interaction of upper and lower troposphere to the maintenance of the summer cloud cluster maximum over the eastern Caribbean Sea
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FLORIDA UNIV., EGLIN AFB.
Response and failure of simple structural elements subjected to blast loadings
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FLORIDA UNIV., GAINESVILLE.
A subgradient algorithm for certain minimax and minisum problems
[AD-A050166] N78-20818

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY).
Pilot project on the application of remote sensing techniques for improving desert locust survey and control
[ISBN-92-5-100112-X] N78-20593
Application of LANDSAT data in desert locust survey and control. Desert locust satellite application project, stage 2
[ISBN-92-5-100402-1] N78-20594

FORSCHUNGSINSTITUT FUER HOCHFREQUENZPHYSIK, WERTHHOVEN (WEST GERMANY).
Signal processing in a high resolution radar
[REPT-2-77] N78-20414

FOSTER-MILLER ASSOCIATES, INC., WALTHAM, MASS.
Development of a spilled oil recovery separator for use as part of an oil spill removal device
[AD-A049711] N78-20657

FREIE UNIV., BERLIN (WEST GERMANY).
Meteorological data, series A monographs. Volume 1, no. 1: A contribution to the cloud climatology of Europe and the Atlantic Ocean using satellite pictures
N78-20714
Meteorological data, series A monographs. Volume 1, no. 3: Thunderstorms in the Berlin area
N78-20715

G

GCA CORP., BEDFORD, MASS.
Characterization of Washington, D.C. carbon monoxide problem
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GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
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GENERAL ATOMIC CO., SAN DIEGO, CALIF.
HTS thermal storage peaking plant
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GENERAL DYNAMICS/CONVAIR, SAN DIEGO, CALIF.
Thermal performance of a customized multilayer insulation [MLI]. Design and fabrication of test facility hardware
[NASA-CR-135051] N78-20257

GENERAL DYNAMICS CORP., GROTON, CONN.
Underwater fluid structure interaction. Part 3: Acoustically-applied forces
N78-20360

GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Long-term CF6 engine performance deterioration: Evaluation of engine S/N 451-479
[NASA-CR-135381] N78-20129

GENOA UNIV. (ITALY).
Improving spacecraft attitude control accuracy with online statistical observers
N78-20218

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
Water resources data for Alaska, water year 1976
[PB-275889/4] N78-20598

GEOPHYSICS CORP. OF AMERICA, BEDFORD, MASS.
Characterization of the Washington, D.C. oxidant problem
[PB-275458/8] N78-20665

GEORGE WASHINGTON UNIV., ALEXANDRIA, VA.
On the quadratic classification problem for zero-mean stationary normal time series
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GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
Synthesis of rational transfer functions using active distributed RC networks
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Computing bounds on the location of an isolated local minimizer
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GEORGETOWN UNIV., WASHINGTON, D.C.
Sonic reflection from solid plates
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GEORGIA INST. OF TECH., ATLANTA.
Computational properties of regular processor networks
N78-20823

GEORGIA MARINE SCIENCE CENTER, SAVANNAH.
Georgia's coastal zone: An inventory of photographic and satellite coverage 1945-1977
[PB-275356/4] N78-20738

GEORGIA UNIV., ATHENS.
The energy question: A case study in major public policy development in a quasi-free enterprise society
N78-20599

GEORGIA UNIV., BRUNSWICK.
Georgia's coastal zone: An inventory of photographic and satellite coverage 1945-1977
[PB-275356/4] N78-20738

GESELLSCHAFT FUER MATHEMATIK UND DATENVERARBEITUNG, BONN (WEST GERMANY).
Representation and digitizing for area encoding
N78-20588

GORDIAN ASSOCIATES, INC., NEW YORK.
Computer model for refinery operations with emphasis on jet fuel production. Volume 1: Program description
[NASA-CR-135333] N78-20350

GTE SYLVANIA, INC., NEEDHAM HEIGHTS, MASS.
A study of application of optics to C3 systems. Volume 2: Visual displays
[AD-A050177] N78-20949

GULF AND WESTERN ADVANCED DEVELOPMENT AND ENGINEERING CENTER, SWARTHMORE, PA.
Balancing of linkages
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H

HAMILTON STANDARD, WINDSOR LOCKS, CONN.
Shuttle environmental and thermal control/life support system computer program
[NASA-CR-151661] N78-20175

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Information storage and retrieval system at Westinghouse Hanford Company Hanford Engineering Development Laboratory (HEDL)
[HEDL-SA-1193] N78-21005

HARRIS CORP., MELBOURNE, FLA.
Hologram replication investigation
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HARRY DIAMOND LABS., ADELPHI, MD.
Feasibility study of rare earth semiconductor lasers of the type Y2HfS5
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HARVARD UNIV., CAMBRIDGE, MASS.
Some analytical methods applied to lake water quality problems
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Absolute two-photon absorption coefficients in ultra violet window materials
[AD-A050379] N78-20952

HAWAII INST. OF GEOPHYSICS, HONOLULU.
Ocean bottom seismometer gimbal systems
[AD-A050470] N78-20740

HAWAII UNIV., HONOLULU.
Employing static excitation control and tie line reactance to stabilize wind turbine generators
[NASA-CR-135344] N78-20603
A computer model for axiomatic systems
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HAWKER SIDDELEY DYNAMICS LTD., STEVENAGE (ENGLAND).
A preliminary study of attitude measurement and control requirements for earth resources satellites
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Attitude control and stabilisation of passive atmospheric sounders on Spacelab
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Design, development and qualification of a 2 Nms reaction wheel
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HOLLANDSE SIGNAALAPPARATEN N. V., HENGELO (NETHERLANDS).
Test experience, grease investigation, evaluation and possible future developments of fixed momentum wheels with hydrodynamic grease lubricated spiral groove bearings
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HOLT (BEN) CO., PASADENA, CALIF.
Geothermal direct contact heat exchange
[SAN/1116-1] N78-20638

HONEYWELL, INC., MINNEAPOLIS, MINN.
Low-cost solar air heater
[COO-2929-6] N78-20639
Insensitive control technology development
[NASA-CR-2947] N78-20827

HOUSTON CHEMICAL CO., PITTSBURGH, PA.
Solar heat transport fluids for solar energy collection systems: A collection of quarterly reports
[NASA-CR-150560] N78-20606

HUGHES RESEARCH LABS., MALIBU, CALIF.
Study of surface finishing and coating of DF laser windows
[AD-A050443] N78-20499

I

IBM FEDERAL SYSTEMS DIV., HUNTSVILLE, ALA.
Preliminary design review package for the solar heating and cooling central data processing system
[NASA-CR-150594] N78-20604
Subsystem design package for the on-site monitor at solar heating and cooling sites
[NASA-CR-150578] N78-20607
Site Data Acquisition Subsystem [SDAS] Mod 1, installation, operation, and maintenance manual
[NASA-CR-150579] N78-20608
Subsystem design package for Mod 2 site data acquisition system: Solar heating and cooling
[NASA-CR-150588] N78-20609
Design review package for the on-site monitor for solar heating and cooling systems
[NASA-CR-150590] N78-20611
System design package for the solar heating and cooling central data processing system
[NASA-CR-150595] N78-20622

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
On the group problem and a subadditive approach to integer programming
[AD-A050346] N78-20911

IIT RESEARCH INST., CHICAGO, ILL.
Market study phase 2 follow-up activity. The Baylor Mark 3 Haploscope
[NASA-CR-156141] N78-20758
Manufacturing process applications team [MATeam]
[NASA-CR-150626] N78-21011

ILLINOIS DEPT. OF BUSINESS AND ECONOMIC DEVELOPMENT, SPRINGFIELD.
The Illinois program for comprehensive solar energy legislation
[PB-275565] N78-20648

ILLINOIS INST. FOR ENVIRONMENTAL QUALITY, CHICAGO.
The Illinois program for comprehensive solar energy legislation
[PB-275565] N78-20648

ILLINOIS INST. OF TECH., CHICAGO.
An experimental investigation of oscillating flows over an airfoil
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Effect of cold work and retempering on the toughness of temper embrittled steel
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ILLINOIS UNIV., SAVOY.
The effects of participatory mode and task workload on the detection of dynamic system failures
[AD-A050210] N78-20775

ILLINOIS UNIV., URBANA-CHAMPAIGN.
Source excitation of an open, parallel-plate waveguide
[AD-A050462] N78-20399

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND).
Engineering calculation methods for turbulent flow, volume 1
[IC-AERO-77-102-VOL-1] N78-20091
Engineering calculation methods for turbulent flow, volume 2
[IC-AERO-77-102-VOL-2] N78-20092
Engineering calculation methods for turbulent flow, volume 3
[IC-AERO-77-102-VOL-3] N78-20093

INDIANA UNIV., BLOOMINGTON.
Mineral resources as an element in land use planning for east central Indiana
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The physiology of restricted breathing
N78-20747

INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS (FRANCE).
Thermal conduction in a thin metal plate irradiated by an intense laser beam
[ISL-R-138/76] N78-20476

INSTITUT FUER ANGEWANDTE GEODAESIE, FRANKFURT AM MAIN (WEST GERMANY).
Reports on mapping and topographic measurements. Series 1: Original contributions, issue no. 72
N78-20578
Automatic methods for solving the generalization problem
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Automated cartography in Bavarian agricultural planning
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The data processing system of the Military Survey Office and its use for military thematic mapping N78-20583

EDP supported realization of displacement processes in the cartographic generalization of topographic maps N78-20584

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INSTITUTE FOR TELECOMMUNICATION SCIENCES, BOULDER, COLO.

Electromagnetic cosite analysis [EMCAN] model. Part 1: The feasibility study [PB-275086] N78-20418

Radio channel capacity limitations [PB-275239/2] N78-20419

Operational and cost considerations in the use of optical waveguides in a local information transfer system [PB-275291/3] N78-20420

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS, ROME [ITALY].

Third planning meeting for the monsoon experiment [MONEX] [GARP-SPEC-REPT-25] N78-20724

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS, LAXENBURG [AUSTRIA].

Fusion and fast breeder reactors [IIASA-RR-77-8] N78-20941

IOWA UNIV., IOWA CITY.

The configuration of movement of the semicircular canal cupula N78-20750

Fixed point theorems and surjectivity results for nonlinear mappings in Banach spaces N78-20909

IRT CORP., SAN DIEGO, CALIF.

Low energy atomic collisions [AD-A050456] N78-20933

ISTITUTO SUPERIORE DI SANITA, ROME [ITALY].

Some contributions from the Radiation Laboratory to the 20th National Congress of the Italian Association of Health Physics and Radiation Protection [ISS-P-77/10] N78-20759

Radio protection and diagnosis with X-rays N78-20760

Primary medium energy exposure standard: Comparison between ISS and BIPM N78-20761

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Photodynamic effects induced in man by sensitizers and visible radiation N78-20764

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ITT ELECTRON TUBE DIV., EASTON, PA.

Long life X-ray tubes for AN/TAQ-2 system [AD-A050322] N78-20438

J

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.

A highly accurate method for the determination of mass and center of mass of a spacecraft [NASA-CR-156130] N78-20177

Absolute flux density calibrations of radio sources: 2.3 GHz [NASA-CR-156132] N78-20390

The goldstone energy project [NASA-CR-156133] N78-20618

Solar energy for process heat: Design/cost studies of four industrial retrofit applications [NASA-CR-156139] N78-20619

Multi-wire slurry wafering demonstrations [JPL-PUB-78-37] N78-20620

A probabilistic model of insolation for the Mojave Desert area [NASA-CR-156140] N78-20689

A study of forecast growth with a barotropic model of the atmosphere [NASA-CR-156138] N78-20718

Photomask and pattern programming manual [NASA-CR-156131] N78-20805

JOHNS HOPKINS UNIV., LAUREL, MD.

Coronal structure of the April 10, 1969 solar flare particle event N78-21035

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.

Translations on USSR science and technology: Biomedical and behavioral sciences [JPRS-70876] N78-20742

Space biology and medicine N78-20743

Pilot retraining aimed at stress reduction N78-20744

Translations on USSR science and technology: Physical sciences and technology [JPRS-70873] N78-21041

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N

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Aeronautical Engineering: A continuing bibliography with indexes, supplement 93, February 1978
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On the Shoulders of Titans: A History of Project Gemini
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Earth Resources: A continuing bibliography with indexes, issue 16, January 1978
[NASA-SP-7041[16]] N78-20565
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Flight test results of the Strapdown hexad Inertial Reference Unit [SIRU]. Volume 3: Appendices A-G
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. WALLOPS STATION, WALLOPS ISLAND, VA.

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NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).

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NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

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NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.

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NATIONAL CENTRE OF TRIBOLOGY, RISLEY (ENGLAND).

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NATIONAL MATERIALS ADVISORY BOARD, WASHINGTON, D. C.

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.

Feasibility of monitoring aerosol concentrations by 10.6-micrometer backscatter lidar
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FLA.

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NATIONAL PHYSICAL LAB., TEDDINGTON (ENGLAND).

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NATIONAL SCIENCE FOUNDATION, WASHINGTON, D. C.

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NATIONAL SEVERE STORMS LAB., NORMAN, OKLA.

Application of Doppler weather radar to turbulence measurements which affect aircraft
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NAVAL AEROSPACE MEDICAL RESEARCH LAB., NEW ORLEANS, LA.

Dynamic response of human and primate head and neck to Gy impact statement
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NAVAL AIR PROPULSION TEST CENTER, TRENTON, N.J.

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NAVAL AVIONICS FACILITY, INDIANAPOLIS, IND.

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NAVAL CONSTRUCTION RESEARCH ESTABLISHMENT, DUNFERMLINE (SCOTLAND).

SPAN. User's summary [item 6A2]
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NAVAL INTELLIGENCE PROCESSING SYSTEM SUPPORT ACTIVITY, ALEXANDRIA, VA.

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NAVAL MEDICAL RESEARCH INST., BETHESDA, MD.

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NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.

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NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.

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NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
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NAVAL SUBMARINE MEDICAL RESEARCH LAB., GROTON, CONN.
Implementing an exchange from nitrogen to helium in a large hyperbaric chamber
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NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Junction Input Generator [JIG], a NASTRAN preprocessor theoretical development, user's manual and program listing
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NAVAL TRAINING EQUIPMENT CENTER, ORLANDO, FLA.
Nonprogrammed multiple channel panoramic CCTV system
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NEBRASKA UNIV., LINCOLN.
Applications of remote sensing in resource management in Nebraska
[E78-10099] N78-20567

NEW ENGLAND RIVER BASINS COMMISSION, BOSTON, MASS.
New England region summary report: Severe resource problems and recommendations for their resolution. 1975 assessment of water and related land resources
[PB-275342/4] N78-20664

NEW MEXICO STATE UNIV., UNIVERSITY PARK.
Input, output, and response blocking in immediate recall
[AD-A050302] N78-20771

NEW MEXICO UNIV., ALBUQUERQUE.
Pollyanna: A three dimensional structure/media interaction computer program
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NEW YORK INST. OF TECHNOLOGY, N. Y.
Functional software development
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Sea Grant in North Carolina. A report on the University of North Carolina Sea Grant College program for 1976
[PB-275375/4] N78-20596

NORTH CAROLINA UNIV., CHAPEL HILL.
Chemically modified electrodes. 9: X-ray photoelectron spectroscopy of alkylaminesilanes bound to metal oxide electrodes
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Sea Grant in North Carolina. A report on the University of North Carolina Sea Grant College program for 1976
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NORTH DAKOTA STATE UNIV., FARGO.
An evaluation of the need for and desired location of additional meteorological stations in Southwestern North Dakota
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NORTH DAKOTA UNIV., GRAND FORKS.
HIPLEX radar support, digital radar data processing design and downwind monitoring. Weather modification activities in North Dakota, South Dakota, and Minnesota from 1951 through 1976. Part 1: An historical overview. Part 2: Descriptive summary of each project
[PB-275669/0] N78-20729

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Dynamic interactive manpower planning and analysis program for a matrix organization
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OAK RIDGE Y-12 PLANT, TENN.
Filament power regulator for thermal ionization mass spectrometry
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OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS [FRANCE].
Theoretical and experimental study of the dynamics of a spinning satellite with toroidal tank
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Variational formulations of hydrocapillary vibration problems. Results obtained with the finite element method
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OFFICINE GALILEO S.P.A., FLORENCE [ITALY].
Electro optical earth and sun sensors for spinning satellites: The state of the art in Officine Galileo
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Two axis Infrared Earth Sensor IRES for three axis stabilized satellites
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OHIO STATE UNIV., COLUMBUS.
Electromagnetic modeling of composite wire and surface geometries
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Development of revised light-duty-vehicle emission: Average speed relationships
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OPERATIONS RESEARCH, INC., SILVER SPRING, MD.
Aviation system modeling study and alternatives
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OREGON GRADUATE CENTER FOR STUDY AND RESEARCH, BEAVERTON.
Mechanism singlet oxygen generation by chemical reactions
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OREGON STATE UNIV., CORVALLIS.
On the state and parameter estimation of stochastic bilinear systems
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OREGON UNIV., EUGENE.
An investigation into the comparative utility of color infrared aerial photography and LANDSAT data for detailed surface cover type mapping within Crater Lake National Park, Oregon
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Revised technical guide for review and evaluation of compliance schedules for air pollution sources
[PB-276138/5] N78-20667
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
NASA DART
[NASA-CR-141436] N78-20165
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Nonequilibrium quasiparticle and phonon dynamics in superconductors
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A citizen's guide to the California Coastal Act of 1976
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PERCEPTRONICS, INC., WOODLAND HILLS, CALIF.
Adaptive estimation of information values in continuous decision making and control of remotely piloted vehicles
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Analytical study of laser supported combustion waves in hydrogen
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Raster to lineal conversion analysis, volume 1
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An entire function which interpolates a family of functions with orders ranging between one and infinity
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RAND CORP., SANTA MONICA, CALIF.
Life-cycle analysis of aircraft turbine engines
[AD-A050349] N78-20135
Approximate methods for calculating the properties of heated laminar boundary layers in water
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RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Probability theory and reliability analysis in geotechnical engineering
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Programmer's manual for the CHAP line-drawing processing language
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RICE UNIV., HOUSTON, TEX.
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Hydrogen turbine power conversion system assessment
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Mechanical behavior of titanium alloys: Formation behavior of alpha/beta interface phase in Ti-6Al-4V
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Stability of orbiting spacecraft in presence of liquids
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ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH [ENGLAND].
System study of an inertial attitude-measurement system for earthpointing satellites
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Development of a power augmented electrothermal hydrazine thruster
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A review of the UK T5 electron-bombardment mercury ion thruster
N78-20247
ROYAL NETHERLANDS AIRCRAFT FACTORIES FOKKER, SCHIPHOL-OOST.
Asymmetric oscillation of a passive nutation damper
N78-20194
IRAS attitude control subsystem
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S

SAAB-SCANIA, LINKOPING [SWEDEN].
Post flight report. S19 test flight at Wallops FC, January 1976
[SAAB-RRR-S19-131] N78-20169
Some conclusions from postflight analysis of data from the first test flight with the S19 guidance system
[SAAB-RRR-S19-97] N78-20170
S19 post flight guidance phase simulations
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[SAAB-RRKR-S19-434] N78-20172
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SAINT LOUIS UNIV., MO.
A numerical study of updraft-downdraft interactions during the mature stage of a rotating supercell thunderstorm based upon Doppler radar data
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SANDIA LABS., ALBUQUERQUE, N. MEX.
Materials compatibility information data bank
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Super power generators
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Determination of electron beam characteristics in strong pinches
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SCATTERGOOD SCHOOL, WEST BRANCH, IOWA.
Solar heating system for recreation building at Scattergood School
[NASA-CR-150553] N78-20605
SCIENCE APPLICATIONS, INC., HUNTSVILLE, ALA.
Atmospheric study relating to pad lift-off and entry landing
[NASA-CR-150621] N78-20690
SHAKER RESEARCH CORP., BALLSTON LAKE, N. Y.
Electric motor reliability model
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SHOCK AND VIBRATION INFORMATION CENTER (DEFENSE), WASHINGTON, D. C.
The Shock and Vibration Digest, volume 9, number 6
[AD-A041051] N78-20358
The Shock and Vibration Digest, volume 9, number 11
[AD-A047848] N78-20361
The Shock and Vibration Digest, volume 9, number 12
[AD-A048062] N78-20365
SIGMA RESEARCH, INC., RICHLAND, WASH.
Installation package maxi-therm S-101 heating module
[NASA-CR-150512] N78-20602
SIRA INST. LTD., CHISLEHURST [ENGLAND].
Evaluation of image dissector tubes and CCD image sensors for high accuracy star sensor applications
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SOCIETE ANONYME D'ETUDES ET REALISATIONS NUCLEAIRES, LIMEIL-BREVANNES [FRANCE].
High accuracy static earth sensors
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Star tracker for IPS
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SOCIETE BERTIN ET CIE, VILLEURBANNE [FRANCE].
Aerodynamic fluid-fiber interactions
[NT-77-CN-1] N78-20060
SOCIETE CROUZET, VALENCE [FRANCE].
Microprocessors and LSI-electronics in attitude control systems
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SOCIETE EUROPEENE DE PROPULSION, MOISSY-CRAMAYEL [FRANCE].
Hydrazine thrusters for space applications
N78-20241
SOCIETE EUROPEENE DE PROPULSION, VERNON [FRANCE].
Surface tension tanks for a three axis stabilized satellite
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Dynamics of spinning spacecraft containing various revolving filled eccentric tanks
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SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, LES MUREAUX [FRANCE].
Satellite momentum and reaction wheels with magnetic bearings
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SOLAFERN LTD., BOURNE, MASS.
Prototype solar heating and hot water systems
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SOLAR CONTROL CORP., BOULDER, COLO.
Modular control subsystems for use in solar heating systems for multi-family dwellings
[NASA-CR-150593] N78-20613
SOLAR ENGINEERING AND EQUIPMENT CO., METAIRIE, LA.
Quarterly and monthly reports for solar heating and cooling systems
[NASA-CR-150589] N78-20610
SOUTH DAKOTA STATE UNIV., BROOKINGS.
Investigation of remote sensing techniques as inputs to operational resource management
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SOUTH FLORIDA UNIV., ST. PETERSBURG.
Kinetic and quantitative applications of Auger electron spectroscopy
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Rate of heat release in diesel engines
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SOUTHEASTERN MASSACHUSETTS UNIV., NORTH DARTMOUTH.
A new look at the statistical pattern recognition
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SOUTHERN METHODIST UNIV., DALLAS, TEX.
Environmental noise measurement methodologies
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RF cancellation circuit for shore-based VHF FM transceiver
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Multiplexer/demultiplexer flexibility enhancement program
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Photodissociation of CO2 and quenching of metastables
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STANDARD PRESSED STEEL LABS., NAAS [IRELAND).
Applied research programme on lubrication of titanium bolts. Report on IVD aluminium
[SPS-5229-4] N78-20322
STANFORD RESEARCH INST., MENLO PARK, CALIF.
User's manual for the APRAC-2 emissions and diffusion model
[PB-275459] N78-20666
STANFORD UNIV., CALIF.
The pressure sintering kinetics of iron powders and superplastic ultrahigh carbon steel powders
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Non-linear gyroresonant interactions of energetic particles and coherent VLF waves in the magnetosphere
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Principal components in the nonnormal case: The test for sphericity
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Drop freezing in a Diffusion-Millikan Chamber
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STEVENS INST. OF TECH., HOBOKEN, N. J.
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STUTTGART UNIV. [WEST GERMANY].
Unified concepts of constitutive modelling and numerical solution methods for concrete creep problems
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On isochoric finite elements
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Constant strain finite elements for isochoric strain fields
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Analysis and synthesis of operational loads
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Post-buckling behaviour of elastic circular arches
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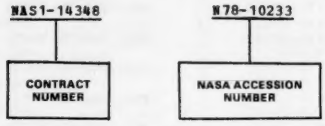

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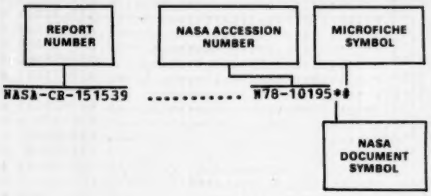

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MRC-TSR-1792 ..... N78-20866 #
MRC-TSR-1794 ..... N78-20867 #
MRC-TSR-1795 ..... N78-20900 #
MRC-TSR-1796-PT-1 ..... N78-20868 #
MRC-TSR-1797 ..... N78-20869 #
MRC-TSR-1798 ..... N78-20870 #
MRC-TSR-1800 ..... N78-20871 #
MRC-TSR-1801 ..... N78-20872 #
MRC-TSR-1803 ..... N78-20286 #
MRC-TSR-1804 ..... N78-20905 #
MRC-TSR-1805 ..... N78-20906 #
MRC-TSR-1806 ..... N78-20901 #
MRC-TSR-1807 ..... N78-20902 #
MRC-TSR-1812-PT-1 ..... N78-20853 #
MRC-TSR-1813 ..... N78-20937 #
MRC-TSR-1814 ..... N78-20287 #

MRG-7717 ..... N78-20907 #

MRL-TN-403 ..... N78-20479

MSSU-EIRS-78/2 ..... N78-20954 #

MTI-77TR2 ..... N78-20514*#

NAPI-TR-2210-PT-4 ..... N78-20436 #

NAPC-PE-2 ..... N78-20134 #

NASA-CR-2825 ..... N78-20116*#
NASA-CR-2828 ..... N78-20117*#
NASA-CR-2867 ..... N78-20154*#
NASA-CR-2900 ..... N78-20082*#
NASA-CR-2927 ..... N78-20914*#
NASA-CR-2929 ..... N78-20280*#
NASA-CR-2932 ..... N78-20574*#
NASA-CR-2944 ..... N78-20141*#
NASA-CR-2947 ..... N78-20827*#
NASA-CR-2954 ..... N78-20920*#
NASA-CR-2955 ..... N78-20921*#
NASA-CR-2969 ..... N78-20464*#
NASA-CR-2970 ..... N78-20118*#
NASA-CR-2975 ..... N78-20514*#
NASA-CR-135051 ..... N78-20257*#
NASA-CR-135283 ..... N78-20802*#
NASA-CR-135284 ..... N78-20803*#
NASA-CR-135285 ..... N78-20804*#
NASA-CR-135298 ..... N78-20621*#
NASA-CR-135310 ..... N78-20310*#
NASA-CR-135333 ..... N78-20350*#
NASA-CR-135344 ..... N78-20603*#
NASA-CR-135349 ..... N78-20489*#
NASA-CR-135357 ..... N78-20250*#
NASA-CR-135378 ..... N78-20150*#
NASA-CR-135381 ..... N78-20129*#
NASA-CR-141436 ..... N78-20165*#
NASA-CR-141437 ..... N78-20572*#
NASA-CR-144863 ..... N78-20534*#
NASA-CR-145190 ..... N78-20094*#
NASA-CR-145192 ..... N78-20112*#
NASA-CR-145255 ..... N78-20946*#
NASA-CR-145316 ..... N78-20145*#
NASA-CR-145322 ..... N78-20076*#
NASA-CR-145323 ..... N78-20077*#
NASA-CR-145328 ..... N78-20168*#
NASA-CR-145337 ..... N78-20062*#
NASA-CR-150512 ..... N78-20602*#
NASA-CR-150553 ..... N78-20605*#
NASA-CR-150560 ..... N78-20606*#
NASA-CR-150578 ..... N78-20607*#
NASA-CR-150579 ..... N78-20608*#
NASA-CR-150588 ..... N78-20609*#
NASA-CR-150589 ..... N78-20610*#
NASA-CR-150590 ..... N78-20611*#
NASA-CR-150592 ..... N78-20612*#
NASA-CR-150593 ..... N78-20613*#
NASA-CR-150594 ..... N78-20604*#
NASA-CR-150595 ..... N78-20622*#
NASA-CR-150599 ..... N78-20614*#
NASA-CR-150600 ..... N78-20615*#
NASA-CR-150601 ..... N78-20616*#
NASA-CR-150604 ..... N78-20617*#
NASA-CR-150621 ..... N78-20690*#
NASA-CR-150624 ..... N78-20480*#
NASA-CR-150625 ..... N78-20573*#
NASA-CR-150626 ..... N78-21011*#
NASA-CR-151654 ..... N78-20174*#
NASA-CR-151657 ..... N78-20947*#
NASA-CR-151658 ..... N78-20066*#
NASA-CR-151659 ..... N78-20427*#
NASA-CR-151660 ..... N78-20571*#
NASA-CR-151661 ..... N78-20175*#
NASA-CR-151662 ..... N78-20756*#
NASA-CR-151665 ..... N78-20162*#
NASA-CR-151666 ..... N78-20156*#
NASA-CR-151667 ..... N78-20157*#
NASA-CR-151668 ..... N78-20158*#
NASA-CR-151669 ..... N78-20159*#
NASA-CR-151670 ..... N78-20160*#
NASA-CR-151671 ..... N78-20161*#
NASA-CR-151672 ..... N78-20163*#
NASA-CR-151673 ..... N78-20164*#
NASA-CR-152063 ..... N78-20773*#
NASA-CR-152079-VOL-1 ..... N78-20136*#
NASA-CR-152079-VOL-2 ..... N78-20137*#
NASA-CR-152079-VOL-3 ..... N78-20138*#
NASA-CR-152082 ..... N78-20918*#
NASA-CR-155772 ..... N78-20566*#
NASA-CR-155801 ..... N78-20567*#
NASA-CR-155962 ..... N78-20568*#
NASA-CR-155964 ..... N78-20569*#
NASA-CR-155968 ..... N78-20570*#
NASA-CR-156062 ..... N78-20688*#
NASA-CR-156066 ..... N78-20782*#
NASA-CR-156067 ..... N78-20100*#
NASA-CR-156088 ..... N78-21023*#
NASA-CR-156112 ..... N78-20152*#
NASA-CR-156115 ..... N78-20102*#
NASA-CR-156116 ..... N78-20334*#
NASA-CR-156117 ..... N78-20153*#
NASA-CR-156119 ..... N78-20109*#
NASA-CR-156120 ..... N78-20067*#
NASA-CR-156121 ..... N78-20068*#
NASA-CR-156122 ..... N78-20069*#
NASA-CR-156123 ..... N78-20070*#
NASA-CR-156129 ..... N78-21032*#
NASA-CR-156130 ..... N78-20177*#
NASA-CR-156131 ..... N78-20805*#
NASA-CR-156132 ..... N78-20390*#
NASA-CR-156133 ..... N78-20618*#
NASA-CR-156134 ..... N78-20620*#
NASA-CR-156135 ..... N78-20155*#
NASA-CR-156136 ..... N78-20462*#
NASA-CR-156137 ..... N78-20693*#
NASA-CR-156138 ..... N78-20718*#
NASA-CR-156139 ..... N78-20619*#
NASA-CR-156140 ..... N78-20689*#
NASA-CR-156141 ..... N78-20758*#
NASA-CR-156142 ..... N78-20110*#
NASA-CR-156143 ..... N78-20111*#
NASA-CR-156713 ..... N78-20989*#
NASA-CR-156714 ..... N78-20990*#
NASA-CR-156715 ..... N78-20051*#
NASA-CR-156716 ..... N78-20166*#
NASA-CR-156717 ..... N78-20167*#
NASA-CR-156721 ..... N78-20391*#

NASA-RP-1021 ..... N78-21019*#

NASA-SP-4203 ..... N78-20151*#
NASA-SP-7037(93) ..... N78-20049*+
NASA-SP-7041(16) ..... N78-20565*+

NASA-TM-56 ..... N78-20100*#
NASA-TM-72846 ..... N78-20457*#
NASA-TM-73224 ..... N78-20098*#

NASA-TM-73275 ..... N78-20389*#
NASA-TM-73760 ..... N78-21010*#
NASA-TM-73866 ..... N78-20755*#
NASA-TM-73887 ..... N78-20458*#
NASA-TM-73896 ..... N78-20511*#
NASA-TM-74049 ..... N78-20071*#
NASA-TM-74058 ..... N78-20072*#
NASA-TM-74093 ..... N78-20073*#
NASA-TM-75025 ..... N78-20368*#
NASA-TM-75145 ..... N78-20490*#
NASA-TM-75193 ..... N78-21033*#
NASA-TM-78066 ..... N78-20691*#
NASA-TM-78085 ..... N78-20575*#
NASA-TM-78088 ..... N78-20692*#
NASA-TM-78089 ..... N78-20576*#
NASA-TM-78090 ..... N78-21028*#
NASA-TM-78092 ..... N78-20392*#
NASA-TM-78095 ..... N78-20393*#
NASA-TM-78102 ..... N78-20928*#
NASA-TM-78105 ..... N78-21039*#
NASA-TM-78106 ..... N78-21040*#
NASA-TM-78109 ..... N78-20577*#
NASA-TM-78110 ..... N78-21012*#
NASA-TM-78112 ..... N78-21013*#
NASA-TM-78114 ..... N78-21029*#
NASA-TM-78162 ..... N78-20335*#
NASA-TM-78452 ..... N78-20113*#
NASA-TM-78473 ..... N78-20917*#
NASA-TM-78635 ..... N78-20460*#
NASA-TM-78663 ..... N78-20144*#
NASA-TM-78666 ..... N78-20074*#
NASA-TM-78672 ..... N78-20108*#
NASA-TM-78676 ..... N78-20919*#
NASA-TM-78677 ..... N78-20061*#
NASA-TM-78679 ..... N78-20050*#
NASA-TM-78680 ..... N78-20075*#
NASA-TM-78681 ..... N78-20535*#
NASA-TM-78688 ..... N78-20461*#
NASA-TM-78689 ..... N78-20481*#
NASA-TM-78826 ..... N78-20459*#
NASA-TM-78827 ..... N78-20251*#
NASA-TM-78837 ..... N78-20254*#
NASA-TM-78841 ..... N78-20333*#
NASA-TM-78846 ..... N78-20255*#
NASA-TM-79422 ..... N78-20717*#
NASA-TM-79423 ..... N78-20757*#
NASA-TM-79530 ..... N78-21014*#
NASA-TM-79531 ..... N78-21015*#

NASA-TN-D-8473 ..... N78-20064*#
NASA-TN-D-8474 ..... N78-20065*#
NASA-TN-D-8478 ..... N78-20063*#

NASA-TP-1116 ..... N78-20139*#
NASA-TP-1121 ..... N78-20256*#
NASA-TP-1122 ..... N78-20078*#
NASA-TP-1123 ..... N78-20536*#
NASA-TP-1124 ..... N78-20079*#
NASA-TP-1136 ..... N78-20080*#
NASA-TP-1140 ..... N78-20143*#
NASA-TP-1141 ..... N78-20927*#
NASA-TP-1144 ..... N78-20948*#
NASA-TP-1146 ..... N78-20128*#
NASA-TP-1147 ..... N78-20142*#
NASA-TP-1150 ..... N78-20512*#
NASA-TP-1151 ..... N78-20130*#
NASA-TP-1156 ..... N78-20338*#
NASA-TP-1157 ..... N78-20115*#
NASA-TP-1160 ..... N78-20351*#
NASA-TP-1161 ..... N78-20336*#
NASA-TP-1162 ..... N78-20959*#
NASA-TP-1163 ..... N78-20081*#
NASA-TP-1167 ..... N78-20140*#
NASA-TP-1169 ..... N78-20463*#
NASA-TP-1171 ..... N78-20114*#
NASA-TP-1172 ..... N78-20654*#
NASA-TP-1179 ..... N78-20176*#
NASA-TP-1192 ..... N78-20281*#
NASA-TP-1194 ..... N78-20131*#
NASA-TP-1196 ..... N78-20513*#
NASA-TP-1197 ..... N78-20337*#
NASA-TP-1199 ..... N78-20132*#
NASA-TP-1200 ..... N78-20806*#
NASA-TP-1204 ..... N78-20133*#

NAVTRAEQUIPC-IH-268 ..... N78-20398 #

NAVTRAEQUIPC-74-C-0048-2 ..... N78-20833 #

NBS-GCR-78-117 ..... N78-20293 #

NBS-SP-500-23 ..... N78-20799 #

NBS-SPECIAL-PUB-500-25 ..... N78-20798 #

NBS-TN-698 ..... N78-20376 #

NBSIR-77-1302 ..... N78-20292 #
NBSIR-77-1404 ..... N78-20982 #

NCAR/AR-76 ..... N78-20731 #

NCRE/R630-ADD ..... N78-20553 #

NDRR-77/01 ..... N78-20719 #

NEPP-IV ..... N78-20626 #

NERRC-77 ..... N78-20664 #

NLR-TR-77069-C ..... N78-20647 #

NMAB-334 ..... N78-20649 #

NMRC-KP-175 ..... N78-20739 #

NMSU-AFOSR-TR-77-2 ..... N78-20771 #

NOAA-TR-ERL-385 ..... N78-20741 #
NOAA-TR-ERL-387-WPL-50 ..... N78-20732 #

NOAA-77091205 ..... N78-20995 #
NOAA-77110705 ..... N78-20596 #
NOAA-77112810 ..... N78-20732 #
NOAA-77112901 ..... N78-20741 #

NOSC/IR-781 ..... N78-20704 #
NOSC/IR-782 ..... N78-20699 #
NOSC/TR-184 ..... N78-20437 #

NPI-COM-90 ..... N78-20795 #

NPL-DMA-248 ..... N78-20261 #

NPL-NAC-83 ..... N78-20796 #

NPS-62AB770801 ..... N78-20406 #
NPS-62AB770901 ..... N78-20407 #
NPS-62SA77111 ..... N78-20923 #

NPS55-77-33 ..... N78-20836 #
NPS55-77-38 ..... N78-20783 #
NPS55-77-45 ..... N78-20791 #
NPS55-78-1 ..... N78-20899 #
NPS61-77-001 ..... N78-20501 #
NPS62-77-001 ..... N78-20443 #
NPS69-77-0005 ..... N78-20516 #

NRL-MR-3543-PT-3 ..... N78-20410 #
NRL-MR-3662 ..... N78-20400 #

NSF-77-64 ..... N78-21008 #

NSF/RA-770222 ..... N78-21017 #
NSF/RA-770310 ..... N78-20378 #
NSF/RA-770322 ..... N78-20291 #
NSF/RA-770326 ..... N78-20380 #
NSF/RA-770352 ..... N78-20670 #
NSF/RA-770379 ..... N78-20671 #

NSWC/WOL/TR-77-85 ..... N78-20545 #

NT-77-CN-1 ..... N78-20060 *

N00014-0860/3 ..... N78-20540 #

ONR-9 ..... N78-20595 #

ONR-TR-6 ..... N78-20258 #

OR-14911 ..... N78-20525 #

ORNL-SUB-4188-2 ..... N78-20645 #

ORNL-5276 ..... N78-20993 #

ORO-4976-77/1 ..... N78-20640 #

OTR-77-130-PT-1 ..... N78-20418 #
OTR-77-132 ..... N78-20419 #
OTR-77-133 ..... N78-20420 #

PATR-1037-77-8 ..... N78-20126 #

PB-272800/4 ..... N78-21008 #
PB-274924/0 ..... N78-20590 #
PB-275086 ..... N78-20418 #
PB-275105 ..... N78-20649 #
PB-275165 ..... N78-20373 #
PB-275169/1 ..... N78-20661 #
PB-275173/3 ..... N78-20292 #
PB-275239/2 ..... N78-20419 #
PB-275259/0 ..... N78-20374 #
PB-275283/0 ..... N78-21017 #
PB-275290/5 ..... N78-20662 #
PB-275291/3 ..... N78-20420 #
PB-275292 ..... N78-20663 #
PB-275309/3 ..... N78-20625 #
PB-275311/9 ..... N78-20627 #
PB-275321/8 ..... N78-20994 #
PB-275334/1 ..... N78-20522 #
PB-275342/4 ..... N78-20664 #
PB-275356/4 ..... N78-20738 #
PB-275371/3 ..... N78-20626 #
PB-275373/9 ..... N78-20995 #
PB-275375/4 ..... N78-20596 #
PB-275378/8 ..... N78-20521 #
PB-275405/9 ..... N78-20371 #
PB-275406/7 ..... N78-20372 #
PB-275421/6 ..... N78-20523 #
PB-275448/9 ..... N78-20770 #
PB-275450 ..... N78-20376 #
PB-275453/9 ..... N78-20557 #
PB-275454/7 ..... N78-20556 #
PB-275455/4 ..... N78-20554 #
PB-275456/2 ..... N78-20555 #
PB-275458/8 ..... N78-20665 #
PB-275459 ..... N78-20666 #
PB-275462/0 ..... N78-20349 #
PB-275518/8 ..... N78-20798 #
PB-275515/5 ..... N78-20799 #
PB-275526/2 ..... N78-20375 #
PB-275565 ..... N78-20648 #
PB-275586/6 ..... N78-21018 #
PB-275631 ..... N78-20996 #
PB-275643/5 ..... N78-20719 #
PB-275669/0 ..... N78-20729 #
PB-275684/9 ..... N78-20380 #
PB-275731/8 ..... N78-20730 #
PB-275741/7 ..... N78-20731 #
PB-275742/5 ..... N78-20739 #
PB-275759/9 ..... N78-20668 #
PB-275760/7 ..... N78-20669 #
PB-275763/1 ..... N78-20655 #
PB-275822/5 ..... N78-20379 #
PB-275869/6 ..... N78-20378 #
PB-275884/5 ..... N78-20670 #
PB-275889/4 ..... N78-20598 #
PB-275891/0 ..... N78-20291 #
PB-275950/8 ..... N78-20520 #
PB-275999/1 ..... N78-20293 #
PB-276024/7 ..... N78-20597 #
PB-276138/5 ..... N78-20667 #
PB-276179/9 ..... N78-20377 #
PB-276188/0 ..... N78-20671 #
PB-276389/4 ..... N78-20732 #
PB-276392/8 ..... N78-20781 #

POLY-EE/EP-77-028 ..... N78-20963 #

PR-381 ..... N78-20960

PSI-TR-97 ..... N78-20489*#

PSU-IRL-PR-77-3 ..... N78-20165*#

PTI-7703 ..... N78-20521 #

PUB-71-1213-00-00 ..... N78-20427*#

PUBL-290 ..... N78-20346 #
PUBL-299 ..... N78-20451 #

QPR-4 ..... N78-20429 #
QPR-10 ..... N78-20810 #
QPR-11 ..... N78-20811 #

QR-1 ..... N78-20441 #
QR-4 ..... N78-20428 #

R-306 ..... N78-20555 #
R-308 ..... N78-20554 #
R-1077 ..... N78-20141*#
R-2103-AF ..... N78-20135 #

RADC-TR-77-254 ..... N78-20980 #
RADC-TR-77-348 ..... N78-20958 #
RADC-TR-77-378 ..... N78-20829 #
RADC-TR-77-388 ..... N78-20483 #
RADC-TR-77-393-VOL-2 ..... N78-20949 #
RADC-TR-77-399 ..... N78-20395 #
RADC-TR-77-400 ..... N78-20405 #
RADC-TR-77-408 ..... N78-20434 #
RADC-TR-77-421-VOL-1 ..... N78-20784 #
RADC-TR-78-3 ..... N78-20525 #

RAND/R-2165-ARPA ..... N78-20466 #

REPT-2 ..... N78-20375 #
REPT-2 ..... N78-20919*#
REPT-2-77 ..... N78-20414 #
REPT-2/77 ..... N78-20519 #
REPT-7 ..... N78-20568*#
REPT-8/76 ..... N78-20961 #
REPT-76-146 ..... N78-20930 #
REPT-77-EG-27 ..... N78-20947*#
REPT-77-1 ..... N78-20465 #
REPT-77-13-48 ..... N78-20668 #
REPT-396-2-77-8 ..... N78-20379 #
REPT-1099-1-VCL-1 ..... N78-20350*#
REPT-78001 ..... N78-20066*#

RI/RD77-252 ..... N78-20621*#

RE-77-1 ..... N78-20818 #
RE-77-3 ..... N78-21018 #

RSL-TM-295-10 ..... N78-20391*#

R77-911739-17 ..... N78-20920*#
R77-911739-18 ..... N78-20921*#
R77-912030-17 ..... N78-20464*#

SAAB-REKB-S19-434 ..... N78-20172 +
SAAB-REKE-S19-435 ..... N78-20173 +

SAAB-REB-S19-97 ..... N78-20170 +
SAAB-REB-S19-131 ..... N78-20169 #

SAAB-RESC-S19A-01 ..... N78-20171 +

SAI-78-780-BU ..... N78-20690*#

SAMSO-TR-77-183 ..... N78-20317 #
SAMSO-TR-77-217 ..... N78-20688*#
SAMSO-TR-78-3423 ..... N78-20502 #

SAN/1116-1 ..... N78-20638 #
SAN/1295-1 ..... N78-20448 #

SAND-77-0248 ..... N78-20644 #
SAND-77-0496 ..... N78-20966 #
SAND-77-0626C ..... N78-20289 #
SAND-77-1237C ..... N78-20253 #
SAND-77-1324C ..... N78-20945 #
SAND-77-1365C ..... N78-20944 #

SC5056-1TR ..... N78-20312 #
SC5115.6FTR ..... N78-20394 #

SDSU-RSI-77-12 ..... N78-20568*#

SERIAL-T-366 ..... N78-20808 #

SM-77-2-PT-3 ..... N78-20374 #

SPD-807-01 ..... N78-20469 #

SPS-5229-4 ..... N78-20322 #

SR-1 ..... N78-21037 #
SR-3 ..... N78-20335*#
SR-5 ..... N78-20980 #

SRL-6856 ..... N78-20936 #

STC-77/363 ..... N78-20345 #

SU-EES-DA-77-4 ..... N78-20864 #

SU-TR-31 ..... N78-20884 #
SU-TR-122 ..... N78-20884 #
SU-TR-187 ..... N78-20529 #
SU-TR-188 ..... N78-20828 #

SWRI-AR-1189 ..... N78-20520 #

SWRI-15-4967 ..... N78-20573*#

TI-ALEX(01)-TR-77-02 ..... N78-20700 #
TI-ALEX(01)-TR-77-05 ..... N78-20701 #
TI-ALEX(01)-TR-77-09 ..... N78-20702 #
TI-ALEX(01)-TR-77-10 ..... N78-20705 #

TI-08-77-48 ..... N78-20435 #

TID-27716 ..... N78-20447 #

TM-NASA-55 ..... N78-20782*#

TM-77-150 ..... N78-20470 #
TM-77-326 ..... N78-20628 #
TM-78-02 ..... N78-20515 #
TM-78-18 ..... N78-20462*#

TN-2/77 ..... N78-20432 #

TR-HWL-1611-877 ..... N78-20542 #

TR-PI-5673 ..... N78-20353 #

TR-1 ..... N78-20318 #
TR-3 ..... N78-20284 #
TR-4 ..... N78-20283 #
TR-5 ..... N78-20544 #
TR-5-SER-2 ..... N78-20887 #
TR-6 ..... N78-20342 #
TR-7 ..... N78-20981 #
TR-8 ..... N78-20922 #
TR-25(OWB) ..... N78-20812 #
TR-32 ..... N78-20547 #
TR-73 ..... N78-20526 #
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